THE ARCHITECTS' JOURNAL

standard contents

every issue does not necessarily contain all these contents, but they are the regular features which continually recur.

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★ A glossary of abbreviations of Government Departments and Societies and Committees of all kinds, together with their full address and telephone numbers. The glossary is published in two parts—A to Ie one week, Ig to Z the next. In all cases where the town is not mentioned the word LONDON is implicit in the address.

IGE	Institution of Gas Engineers. 17, Grosvenor Crescent, S.W.1.	Sloane 8266
IHVE	Institution of Heating and Ventilating Engineers. 75, Eaton Place, S.W.1.	Sloane 3158/1601
IIBD	Incorporated Institute of British Decorators. Drayton House, Gordon Street, W.C.1.	Euston 2450
ILA	Institute of Landscape Architects. 12, Gower Street, W.C.1.	Museum 1783
I of Arb.	Institute of Arbitrators, 35/37, Hastings House, 10, Norfolk Street, Strand, W.C.2.	Temple Bar 4071
IOB	Institute of Builders. 48, Bedford Square, W.C.1.	Museum 7197/5176
IR	Institute of Refrigeration. Dalmeny House, Monument Street, E.C.3.	Avenue 6851
IRA	Institute of Registered Architects. 47, Victoria Street, S.W.1.	Abbey 6172
ISE	Institution of Structural Engineers. 11, Upper Belgrave Street, S.W.1.	Sloane 7128
IWA	Inland Waterways Association. 11, Gower Street, W.C.1.	Museum 9200
LIDC	Lead Industries Development Council. Eagle House, Jermyn Street, S.W.1.	Whitehall 7264/4175
LMBA	London Master Builders' Association. 47, Bedford Square, W.C.1.	Museum 3891
MARS	MARS Group (English Branch of CIAM). Secretary: Gontran Goulden, Building Centre, 9, Conduit Street, W.1.	Mayfair 8641
MOA	Ministry of Agriculture and Fisheries. 55, Whitehall, S.W.1.	Whitehall 3400
MOE	Ministry of Education. Curzon Street House, Curzon Street, W.1.	Mayfair 9400
MOH	Ministry of Health. Whitehall, S.W.1.	Whitehall 4300
MOLGP	Ministry of Local Government and Planning. 23, Saville Row, W.1.	Regent 8411
MOLNS	Ministry of Labour and National Service, 8, St. James's Square, S.W.1.	Whitehall 6200
MOS	Ministry of Supply. Shell Mex House, Victoria Embankment, W.C.	Gerrard 6933
MOT	Ministry of Transport. Berkeley Square House, Berkeley Square, W.1.	Mayfair 9494
MOW	Ministry of Works. Lambeth Bridge House, S.E.1.	Reliance 7611
NAMMC	Natural Asphalte Mine-Owners and Manufacturers Council. 94-98, Petty France, S.W.1.	Abbey 1010
NAS	National Association of Shopfitters. 9, Victoria Street, S.W.1.	Abbey 4813
NBR	National Buildings Record. 37, Onslow Gardens, S.W.7.	Kensington 8161
NCBMP	National Council of Building Material Producers. 10,Princes Street, S.W.1.	Abbey5111
NFBTE	National Federation of Building Trades Employers. 82, New Cavendish Street, W.1.	Langham 4041/4054
NFBTO	National Federation of Building Trades Operatives, Federal House, Cedars Road, Clapham, S.W.4.	Macaulay 4451
NFHS	National Federation of Housing Societies. 13, Suffolk St., S.W.1.	Whitehall 1693
NHBRC	National House Builders Registration Council. 82, New Cavendish Street, W.1	Langham 4341
NPL	National Physical Laboratory. Head Office, Teddington.	Molesey 1380
NSA	National Sawmilling Association, 14, New Bridge Street, E.C.4.	City 1476
NSAS	National Smoke Abatement Society. Chandos House, Buckingham Gate, S.W.1.	Abbey 1359
NT	National Trust for Places of Historic Interest or Natural Beauty. 42, Queen Anne's Gate, S.W.1.	Whitehall 0211
PEP	Political and Economic Planning. 16, Queen Anne's Gate, S.W.1.	Whitehall 7245
RCA	Reinforced Concrete Association. 94, Petty France, S.W.1.	Whitehall 9936
RIAS	Royal Incorporation of Architects in Scotland. 15, Rutland Square, Edinburgh.	Edinburgh 20396
RIBA	Royal Institute of British Architects. 66, Portland Place, W.1.	Langham 5721
RICS	Royal Institution of Chartered Surveyors, 12, Great George St., S.W.1.	Whitehall 5322/9242
RFAC	Royal Fine Art Commission. 22A, Queen Anne's Gate, S.W.1.	Whitehall 3935
RS	Royal Society. Burlington House, Piccadilly, W.1.	Regent 3335
RSA	Royal Society of Arts. 6, John Adam Street, W.C.2.	Trafalgar 2366
RSI	Royal Sanitary Institute. 90, Buckingham Palace Road, S.W.1.	Sloane 5134
RIB	Rural Industries Bureau. 35, Camp Road, Wimbledon, S.W.19.	Wimbledon 5101
SBPM	Society of British Paint Manufacturers. Grosvenor Gardens House, Grosvenor Gardens, S.W.1.	Victoria 2186
SCR	Society for Cultural Relations with the USSR. 14, Kensington Square, London, W.8.	Western 1571
SE	Society of Engineers. 17, Victoria Street, Westminster, S.W.1.	Abbey 7244
SFMA	School Furniture Manufacturers' Association. 30, Cornhill, London, E.C.3.	Mansion House 3921
SIA	Structural Insulation Association. 14, Moorgate, London, E.C.2.	Central 4444
SIA	Society of Industrial Artists. 7, Woburn Square, W.C.1.	Langham 1984
SNHTPC	Scottish National Housing. Town Planning Council. Hon. Sec., Robert Pollock, Town Clerk, Rutherglen.	
SPAB	Society for the Protection of Ancient Buildings. 55, Great Ormond Street, W.C.1.	Holborn 2646
TCPA	Town and Country Planning Association. 28, King Street, Covent Garden, W.C.2.	Temple Bar 5006
TDA	Timber Development Association. 21, College Hill, E.C.4.	City 4771
TGC	The Gas Council. 1, Grosvenor Place, S.W.1.	Sloane 4554
TPI	Town Planning Institute. 18, Ashley Place, S.W.1.	Victoria 8815
TTF	Timber Trades Federation. 69, Cannon Street, E.C.4.	City 4444
WDC	War Damage Commission. Devonshire House, Mayfair Place, Piccadilly, W.1.	Mayfair 8866
WEDA	Welfare Equipment Development Association. 74, Victoria Street, S.W.1.	Victoria 5783
ZDA	Zinc Development Association.	

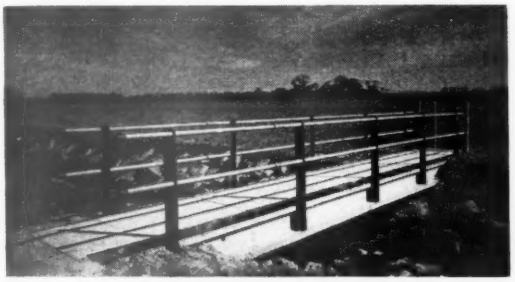
A

Prestressed Concrete
IN BRIDGE CONSTRUCTION

Positioning Dow-Mac Prestressed Beams at Exton Park Road Bridge, near Cottesmore, Rutland, built by the United Steel Companies, Ltd. (Ore Mining Branch). Photograph by courtesy of the United Steel Companies, Ltd.

Loushers Lane Bridge, near Warrington. Lowering Dow-Mac Prestressed Beams into position. Photograph by courtesy of J. V. Hughes, M.I.C.E., Borough Engineer and Surveyor, Warrington County Borough.

Dow-Mac Prestressed Beams are incorporated in this footbridge at Cockbeck, near Leeds, built for the Division of Opencast Coal Production, Ministry of Fuel and Power by William Pepper & Co. Ltd., 19 Park Row, Leeds, 1.



Dow-Mac prestressed bridge beams of standard section and lengths are now available. Research thus combines all the advantages of the Dow-Mac Prestressed system (saving in labour, steel, timber, reduced weight, high flexibility and resilience) with the convenience and economy of the pre-cast unit.

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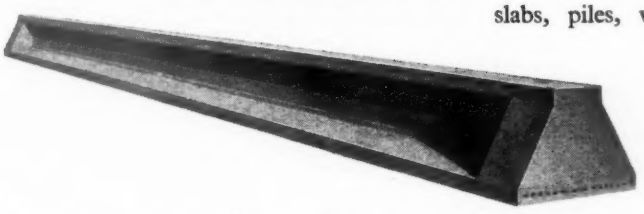

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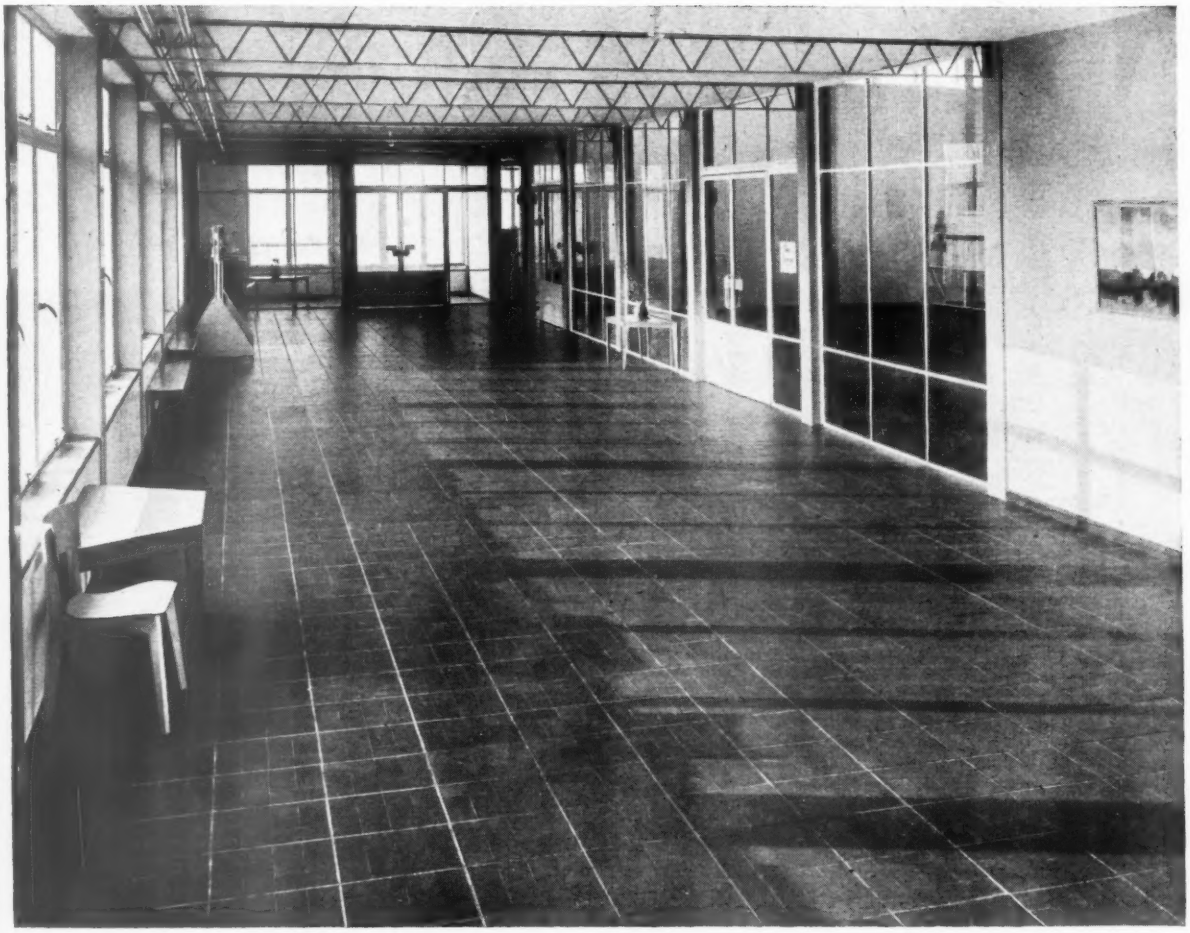

Wheatly Russet Brown "TRITON" 6" x 3" Quarries, laid basket pattern, at Oxhey Wood School, Northwick Road, Oxhey, Herts.

Architects: Gollins, Melvin & Partners, in association with C. H. Aslin, C.B.E., County Architect.

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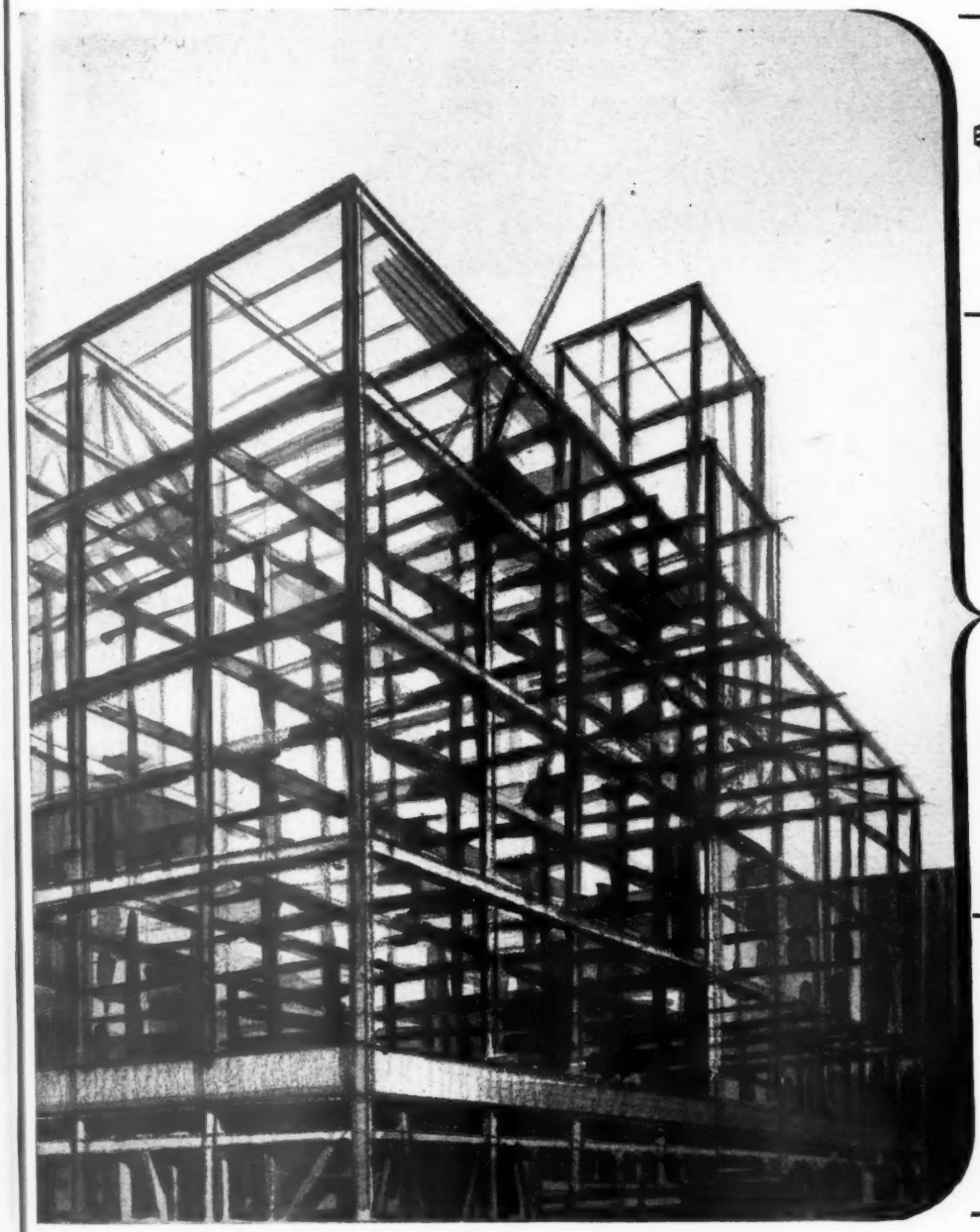

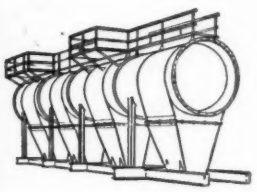

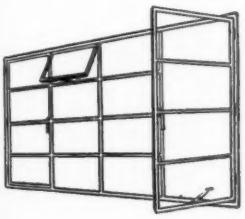

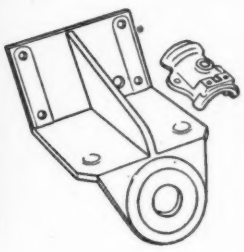

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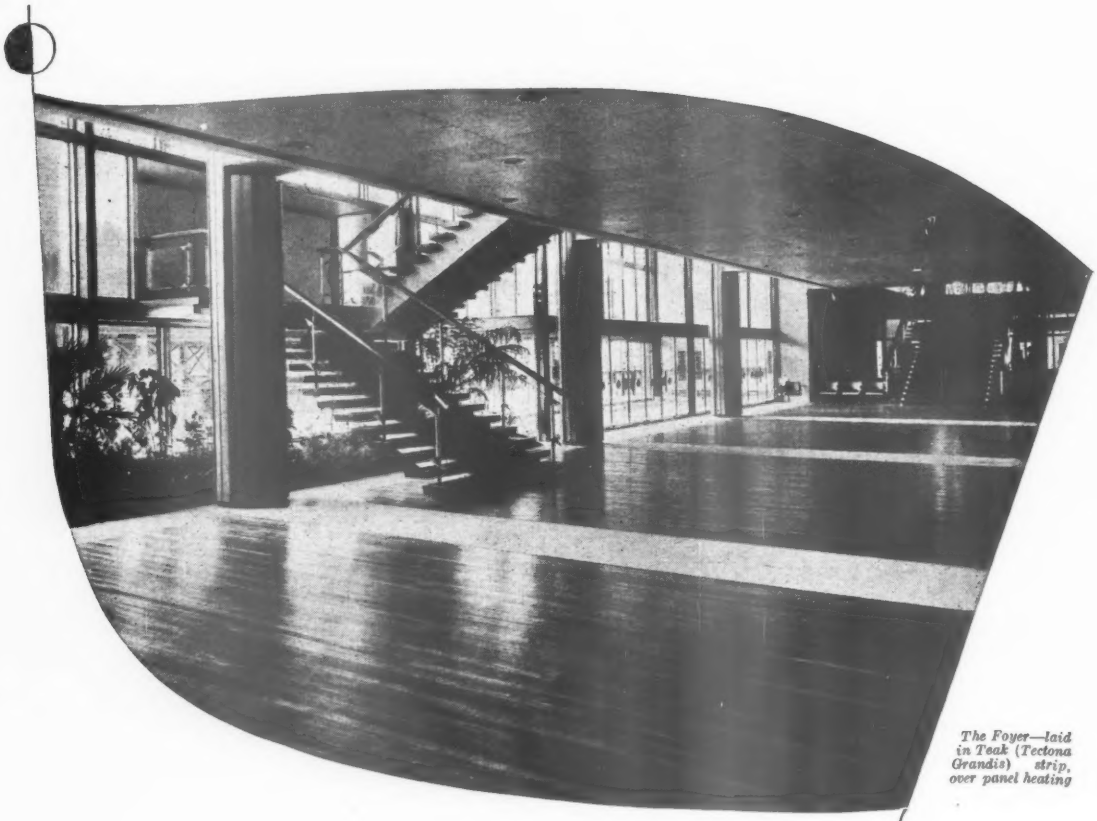

The Foyer—laid in Teak (Tectona Grandis) strip, over panel heating

above controversy

Many people have taken sides over the Concert Hall, some applauding its modernism others deploring its departure from tradition. But in all this controversy the one feature at which no criticism has been levelled is the flooring—laid by Vigers in hardwood block and strip.

Indeed, about that there can be no argument. For whatever the architectural style, a hardwood floor is always appropriate. It pleases everybody. Not only æsthetically but economically. A hardwood floor will last a lifetime—the life of the building—providing over the years an investment in charm, comfort and wearing quality that shows no depreciation.

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About Aluminium . . . 7

CHEMICAL PROPERTIES

This article is one of a series, written for the interest of students and others, outlining some of the main characteristics of the metal and its structural alloys.

THE durability, or resistance to deterioration by corrosive agencies, of aluminium and many of its alloys is exceptionally high, frequently enabling them to be used without surface protection of any sort, so saving both pre-treatment and maintenance costs. This is often of greater value than its more generally appreciated qualities, such as light weight.

Atmospheric Exposure

Aluminium does, in fact, combine readily with atmospheric oxygen, but the oxide, unlike those of iron or copper, forms as a continuous film, which is hard and very adherent. This stable layer of oxide seals the metal from further oxidation, reforming spontaneously when the surface is cut or abraded in air. Its thickness, as naturally formed, depends on the alloy and on the nature and duration of exposure, but is of the order of a hundred-thousandth of an inch. It is transparent or nearly so, becoming visible as a grey film when thickened by age, exposure, or heating. The metal is exposed to attack only when the surface film is broken and, by lack of oxygen, prevented from reforming.

The nature of the film, and the immunity of the metal, are influenced by the presence of alloying constituents, and some of the strong copper-bearing alloys, for instance, normally need some means of protection. However, the medium-strength alloys that are used for building, and for the majority of civil and mechanical engineering purposes, can generally be used without protection.

Particular attention must be given to alloy selection and conditions of use when the surroundings are industrial and the air may carry many kinds of pollution, some of them aggressive. Except in special cases, however, aluminium will generally outlast other metals and is increasingly used, for instance, on factory roofs in place of galvanized steel.

The aluminium-magnesium group of alloys is particularly resistant to sea and coastal atmospheres, and is used in ship and boat construction.

Exposure of the bare metal to any atmosphere must, after a period (perhaps of years) that will depend on the circumstances, impair its original lustre and smoothness, and, in severe conditions, surface deposits and slight pitting may appear. These changes are almost always superficial, and the appearance can be restored by cleaning.

Aggressive Conditions

Apart from direct attack by corrosive agents, such as alkaline or acidic fumes, or contact with damp cement or plaster, most instances of corrosion in aluminium alloy structures occur in places where air is excluded, often by entrapped moisture. Local corrosion may be the result of an electrochemical process, and when a film of liquid can act as an electrolyte, galvanic action is liable to occur between zones of unequal potential, as provided by dissimilar metals, different alloys of aluminium, or even the aluminium and its own alloying elements or impurities. Copper and nickel are particularly aggressive, iron less so.

Susceptibility of an alloy to corrosion is influenced by other internal factors besides its chemical composition, such as grain size, heat treatment history, and the stress to which the metal is subjected.

Food and Chemicals —

The aluminium employed for processing, packing, and cooking foods does not generally need protection, although for packing some products, cans may be lacquered. As the salts of aluminium are colourless, tasteless, and non-poisonous, there are no ill effects when strongly alkaline or acid foods dissolve minute amounts of the metal.

In the chemical industry, aluminium is extensively used, again generally unalloyed and sometimes of especially high purity. It offers considerable resistance to the action of most organic compounds and of such common chemicals as ammonia, sulphuretted hydrogen, and nitric and acetic acids; it is adversely affected by most alkalies, sulphuric and hydrochloric acids, chlorides, carbonates, and fluorides. Interaction is, however, dependent on the concentration and temperature of the reagent, and may be reduced or inhibited altogether by the presence of other substances. The whole subject is very complex and in the space available it is not possible to be more specific.

Protection

In any metallic structure, corners and crevices in which moisture can lodge should be avoided in design or effectively drained or sealed during construction.

Joints between aluminium and other metals can be insulated with a sealing paint (e.g. bitumen) or, preferably, with an inhibiting paint containing zinc chromate or barium chromate. Copper and copper alloy parts should not be used near aluminium structures where there is any possibility of interaction through a moisture layer. Steel bolts, nuts and other fittings are best galvanized or cadmium-plated. Where water-absorbent materials, such as wood and cloth, are in contact with an aluminium surface, it is advisable to interpose a coat of varnish or bituminous paint.

In severe conditions, or when an alloy of inferior corrosion-resistance is to be used, all-over painting may be necessary. Correctly applied, paints last particularly well on aluminium, and should the metal be attacked through damage to the paint, there is no tendency, as there is with rust, for the attack to spread under the paint film. A good base coat is provided by the modern priming paints containing an acid reagent that expends itself in lightly etching the metal. In the best work this is followed by an inhibitive zinc or barium chromate paint, before the finishing coats are applied. Bituminous paint is satisfactory where it is not exposed to sunlight.

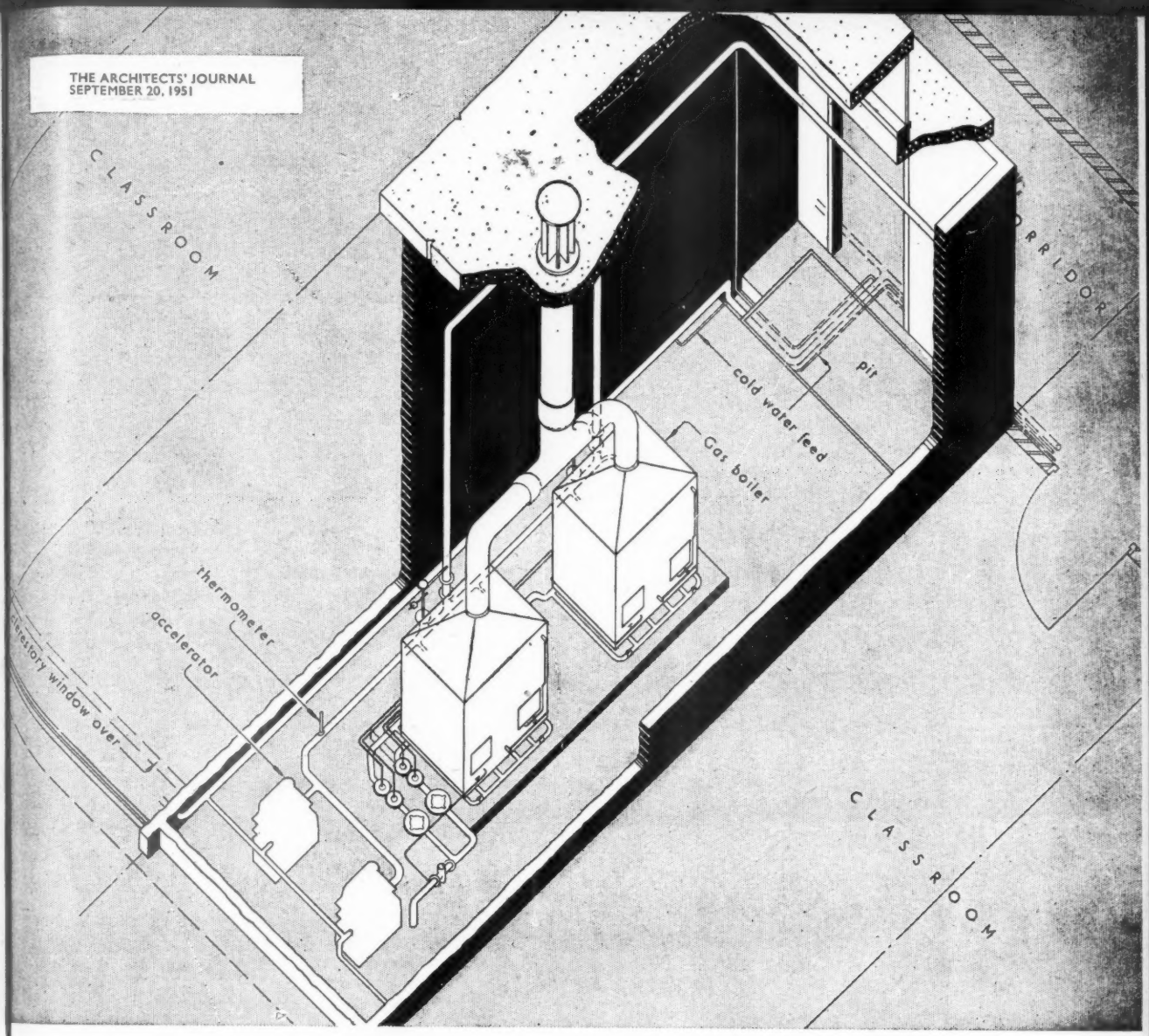
Another form of surface protection for strong alloy sheet is applied by the metal fabricator, by 'cladding'. The alloy ingot is sandwiched between plates of high-purity aluminium, which the hot-rolling operations bond permanently to the faces. By whatever amount the gauge of the sheet is thereafter reduced, each skin will represent about 5% of the total thickness, insulating the strong alloy core from attack and giving electrolytic protection at cut edges and scratches. 'Alclad' sheet was first developed for aircraft construction.

A protective measure widely used in certain fields is the anodizing process, in which the natural oxide film is thickened electrolytically in an acid bath. The film, when freshly developed, is absorbent, and if desired it can be dyed for decoration, or filled with a grease or wax for added protection.

Plating of aluminium with other metals, such as chromium, is practised on a relatively small scale for decoration or to improve the wearing qualities of machine parts. The presence of the oxide film complicates deposition, but reliable methods of overcoming this have been developed.

It may be found that the Noral Data Sheet, which lists mechanical and physical properties of our alloys, is a useful appendix to these articles. We shall be pleased to send you a copy; please mention this journal when writing.

The eighth article will outline thermal characteristics of the metal.



Boiler house for New Classroom Block, Twickenham Technical College. County Architect : C. G. Stillman, F.R.I.B.A.

GAS solved this school heating problem

Gas-fired low pressure central heating is installed in this most recent extension to Twickenham Technical College, opened in 1948.

Factors which influenced the choice of boiler plant were : the distant situation of the new buildings in relation to the main boiler house ; the difficulty of providing fuel storage and access to it ; and the difficulty of providing a suitable chimney that would be unaffected by the proximity of adjacent high buildings.

The new single-storey block contains eight classrooms with cloakroom accommodation. The total catalogue rating of the two automatically controlled boilers is 720,000 B.T.U's per hour.

Helpful information on this and other aspects of the problem of securing efficient services for cooking, hot water, space heating and refrigeration may be obtained from the local Gas Undertaking.

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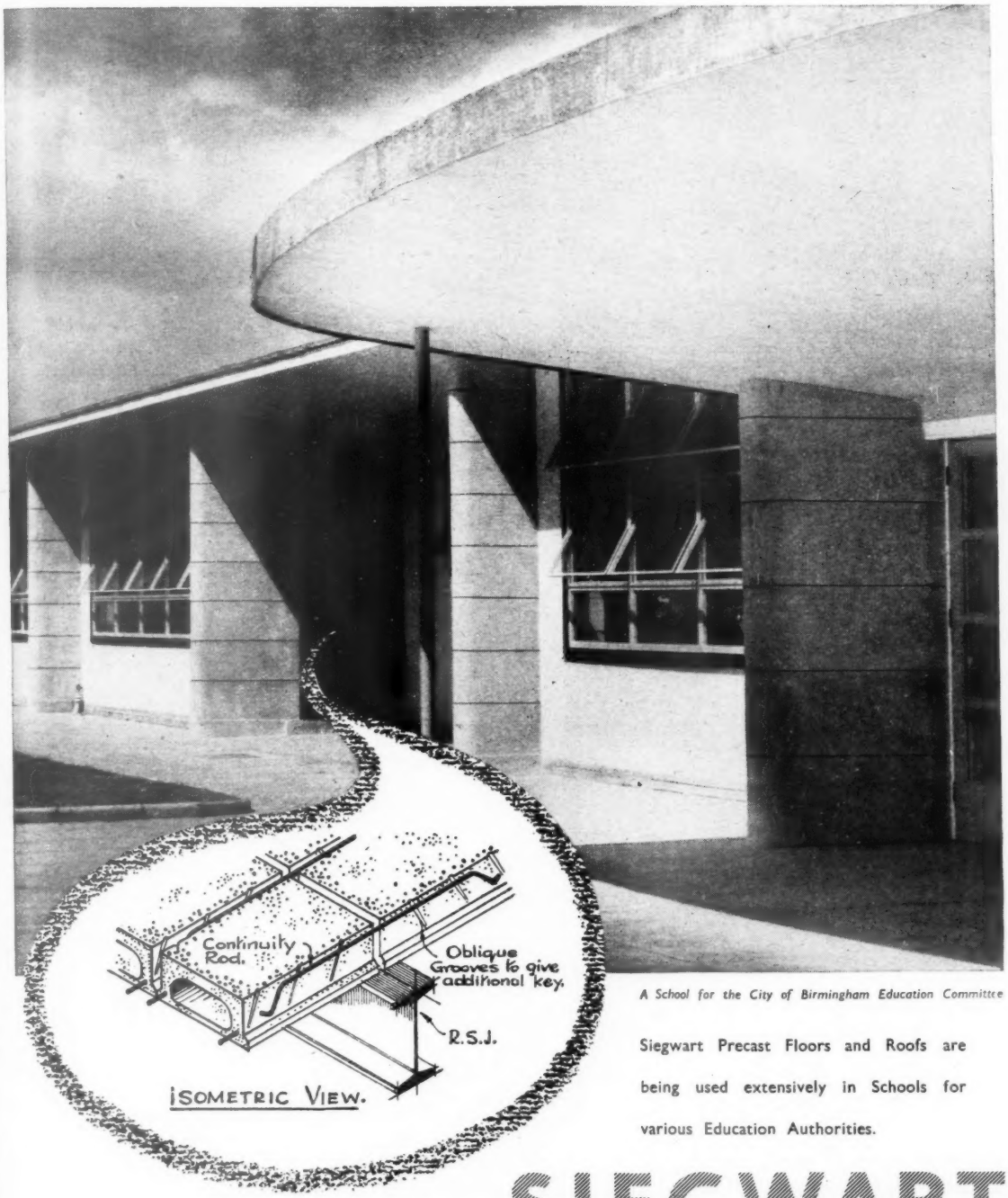

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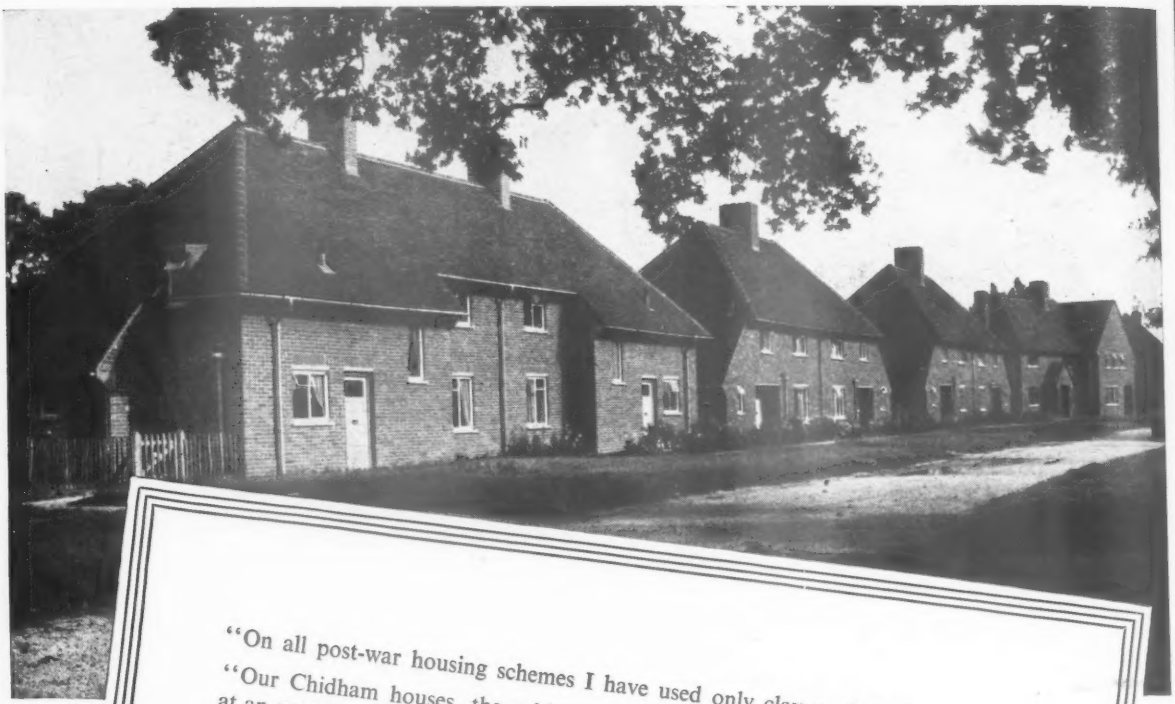

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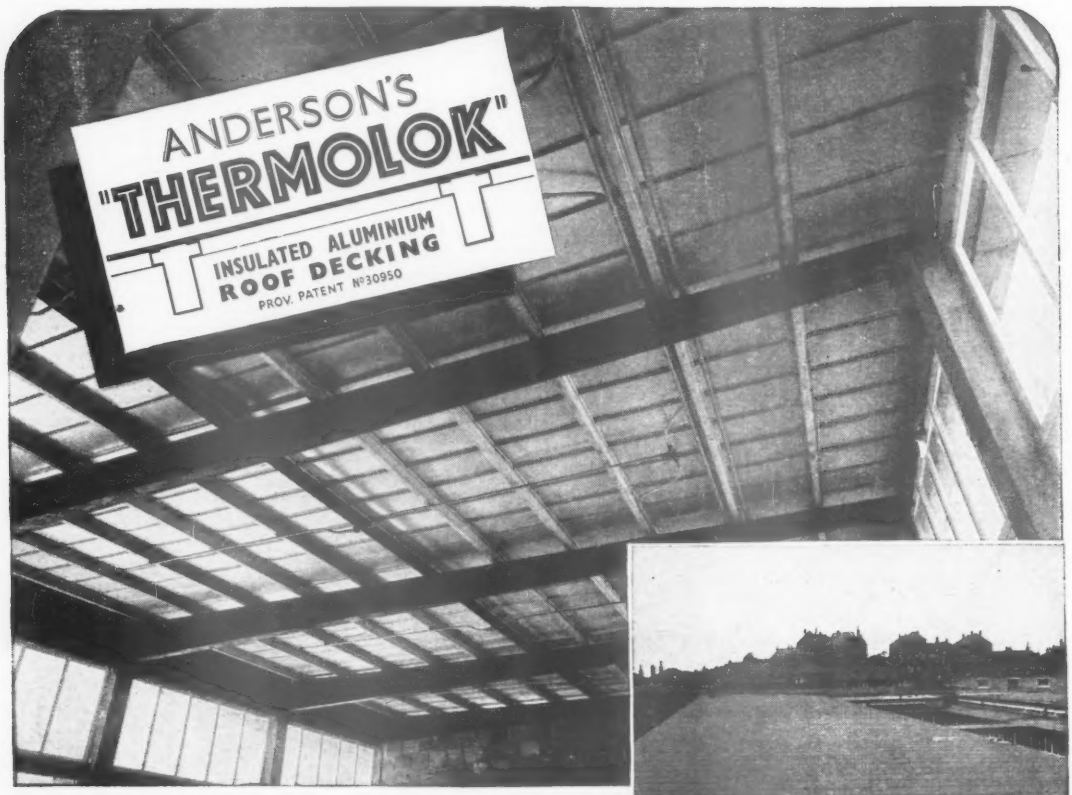
Extract from a letter received from Mr. J. K. Lawson, F.R.I.C.S., A.M.I.S.E., Engineer and Surveyor, Rural District Council, Chichester.

* Ministry Housing Medal.

For information on Clay Roofing Tiles, please apply to The Secretary, The National Federation of Clay Industries, Drayton House, London, W.C.1. (Euston 2568)



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The design is exclusive and embodies features which mark a big advance in roof construction.

The system is flexible and can be adapted to suit special requirements. "THERMOLOK" can be supplied in several gauges, and the bar sections increased to take spans greater than 10 feet.

A high insulation value can be obtained resulting in fuel economy and more comfortable interior conditions; condensation risk is reduced to a minimum.

The interior appearance of "THERMOLOK" with its pleasing design and light aluminium colour eliminates the necessity for a separate ceiling

The light weight and strength of "THERMOLOK" enable economy in design of the sub-structure to be obtained to the maximum extent.

No scaffolding is necessary and a speedy erection is assured. Fastenings are reduced to a minimum by means of the patent locking device.

Durable waterproofing is provided by Anderson's "DUROK" Roofing System, and a variety of finishes can be given, if desired, to secure a pleasing appearance and to harmonize with surroundings.

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J N 81

TEST FOR A SEALING COMPOUND

Architect: Ralph Tubbs
Consulting Engineers:
Freeman Fox & Partners
Contractors for the Dome of Discovery:
Horseley Bridge & Thomas Piggott Ltd.

Thermal movements, wind vibration, not to speak of man-made structural disturbance during construction and routine inspection, are some of the factors that made weatherproofing the Dome of Discovery a problem. The sealing compound used had to 'give' without cracking, expand or contract without creeping and still be completely waterproof.

SECOMASTIC provided the solution to this problem. Correctly used, it is the best and most economical method of ensuring weatherproof joints wherever movement is likely to occur between two contiguous building units.

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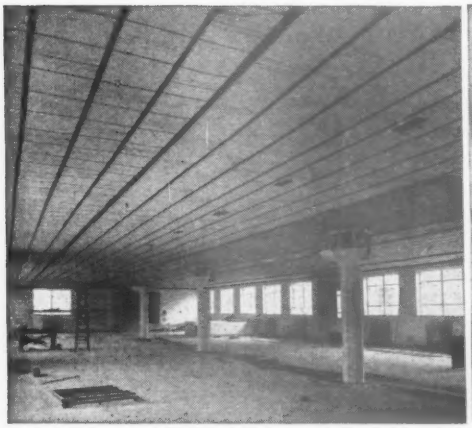
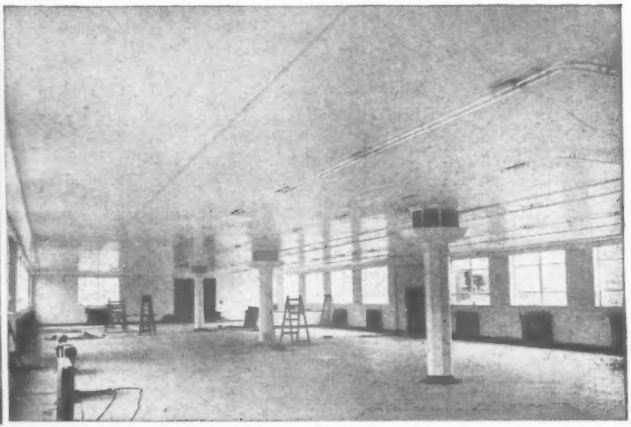
The "**Plaxstele**" suspended ceiling has a substantial plaster finish *with high fire resisting properties*

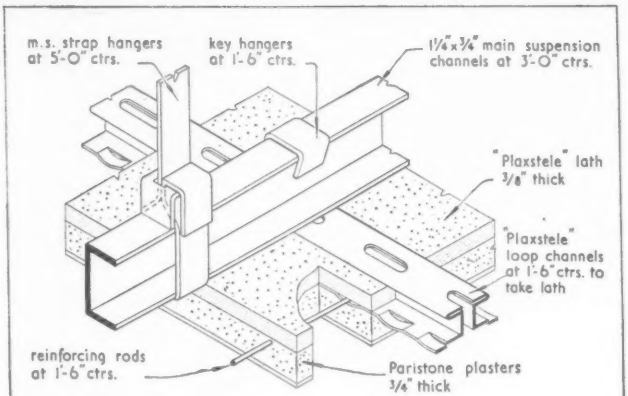




The "PLAXSTELE" ceiling system is adaptable to any type of building construction and can be suspended horizontally at any level below the main roof structure. It provides a suspended ceiling with a substantial, smooth plaster finish having high fire resisting properties.

The system combines the use of "PLAXSTELE" lath, specially designed for plastering with "PARISTONE" plaster, with metal patented suspension and jointing members which hold the lath rigid and at the same time anchor metal reinforcing rods in the plaster finish.

Advantages of the system include simplification of plastering work, saving of time, elimination of timber framing, superior strength, improved thermal insulation and high fire resistance (B.R.S. One hour. Grade D). Further information about this and other "GYPROC" products or systems will gladly be supplied.



The photographs show
a large area of PLAXSTELE *ceiling before and after plastering, decorating and fixing strip lighting.*

The isometric sketch shows
the general assembly of the component parts.

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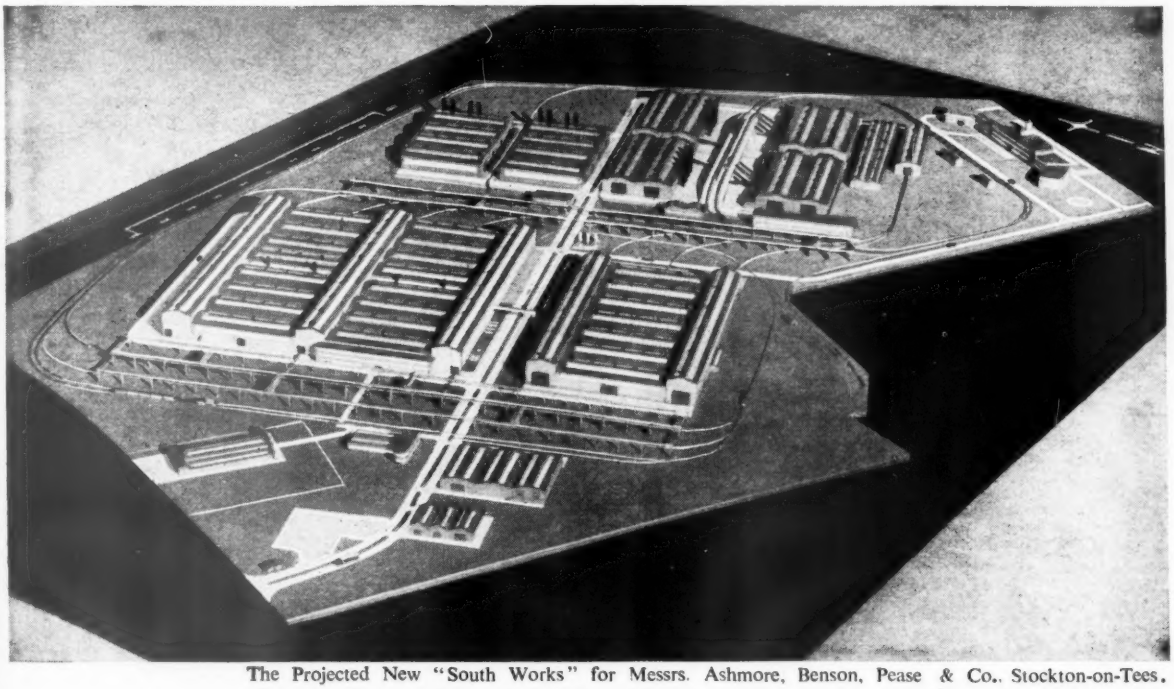

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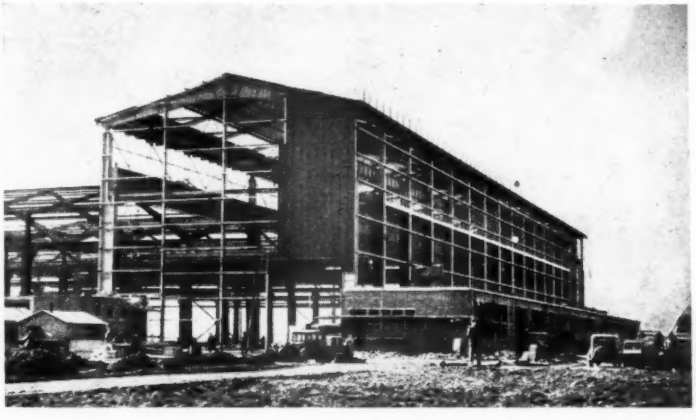

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AJ

THE ARCHITECTS' JOURNAL

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LONDON RECONSIDERED

The Poles have long been the master craftsmen among architectural model-makers, and the exhibition of plans for the improvement of London now to be seen at the ICA in Dover Street is worth visiting for the exquisite models and the charm of the presentation alone.

*

It is also worth visiting for the ideas displayed, some of which are illustrated, I believe, elsewhere in this issue. They are the product of many years' research into the problem of London by the civic design students and staff at the School of Architecture, Polish University College, London University. Behind them all are the ideas and energy of Konrad Smigielski, the assistant professor of civic design.

I have heard the criticism made that frankly Utopian projects of the kind shown, which take no account of cost or immediate practicability, do harm by identifying town-planning in the public mind with castles in the air rather than everyday realities. But the risk is worth taking if it persuades the London public to look at its own city more critically.

SOUND RESEARCH

I spent a day last week at Division I of the Building Research Congress—the meetings held at the Institute of Civil Engineers in Great George Street. Apart from the heat, which I suppose was due mainly to the weather, I was somewhat shaken by the noises off. Odd thumps I assumed to be pile driving for the Colonial Office, which is being built next door, but inside the building there seemed to be regular plumbing demonstrations and destruction tests on bell metal trays going on. However, the speakers persevered and I managed to hear nearly all that was said.

NEWS ABOUT JACK

The evening of the same day I attended a cocktail party given, with the lavish hospitality which is typical of them, by the LMBA for the overseas delegates of the Research Congress. Amongst the hundreds present I chanced to meet Dr. Walter Taylor of the United States, representing the AIA, whose task it is as Director of the AIA's research department to try and get some co-ordination of research in the States—the equivalent American task, in fact, of that of the European Building Research Organizing Committee whose meeting at Maidenhead I mentioned last week.

*

Dr. Taylor was able to confirm a report, which by an odd coincidence I had received in that morning's post, that amongst the supplies of building materials and equipment which were getting increasingly scarce in the States (due, of course, to their enormous re-armament programme) there was a great shortage of supplies of jacks for slab-lifting. This technique, which has been copiously reported in the JOURNAL, is the development of the Texas Institute of Inventive Research, and I learn that they have opened negotiations (complicated by currency problems) with a manufacturer over here to make the slab-lifting equipment, with the possibility that, if the equipment is not snapped up for building operations in Britain, they will ship it to America.

*

Dr. Taylor, who had recently visited one of the buildings erected by this method, seemed very enthusiastic about its possibilities, and I gather that there are over fifty jobs using this technique now under way in the States. It is disappointing, though, that things move so slowly as far as this country is concerned.

FROM BRIGHTON TO VERMONT

In my strictures on the creaming of Brighton Pavilion last week I mentioned Clifford Musgrave's new book on the building but omitted to name it. It is called *Royal Pavilion: A Study in the Romantic** and is as admirable a history of its subject as one could well ask for. While the activities of Holland, Porden, Repton and Nash naturally take up most of Mr. Musgrave's space, he also finds room to recall the events (some of them fantastic enough) for which the Pavilion formed the setting.

*

From Brighton let me whisk your thoughts off to Kenwood, near Highgate. It isn't such a far cry as you

* Bredon and Heginbotham, Brighton. 15s

might suppose; for was not the architect George Saunders, who added the wings to Kenwood House as Robert Adam left it, " perhaps a pupil and certainly a follower of Henry Holland," who designed the villa which still forms the nucleus of the Pavilion? The phrase in quotes is from an elegant and very well illustrated little booklet just issued by the LCC under the title *The Iveagh Bequest, Kenwood: A Short Account of its History and Architecture**; author, John Summerson. To read it is to resolve to re-visit Kenwood at the earliest opportunity.

*

If I can't say that A. R. Woolley's *Oxford: University and City*,† made me resolve to re-visit Oxford at the earliest opportunity, it is because no book is necessary for that. But Mr. Woolley's book, which ingeniously contrives to be guide, miniature history and picture book at once, shall certainly go with me on my next visit to that still delectable city. My only quarrel with Mr. Woolley is that he doesn't mention *An Oxford University Chest*, which you will remember for Moholy Nagy's inspired photographs, in his bibliography.

*

Unfortunately, it isn't much good resolving to visit the buildings described by the late Thomas Tileston Waterman in *The Dwellings of Colonial America*‡ —unless you have a cache of dollars in the right place. Most of us will have to be content with brooding over the photographs in this solidly produced book, which is likely to remain the standard work on Transatlantic Georgian (domestic) for many years to come. Its author, who died last January, was well known in the States as an architect who specialized in restoration work, as well as a writer.

CORRECTIONS

Two weeks ago, when referring to the radio exhibition, I commented unfavourably on the appearance of the hall in which it was being held. Unfortunately, I called the building the Empress Hall—which is the name of the nearby sports arena—but I intended my comments to apply, of course, to the Earls Court Exhibition Building. My apologies for this inaccuracy.

* L.C.C. 1s.
† Art and Technics. 21s.
‡ University of North Carolina Press.

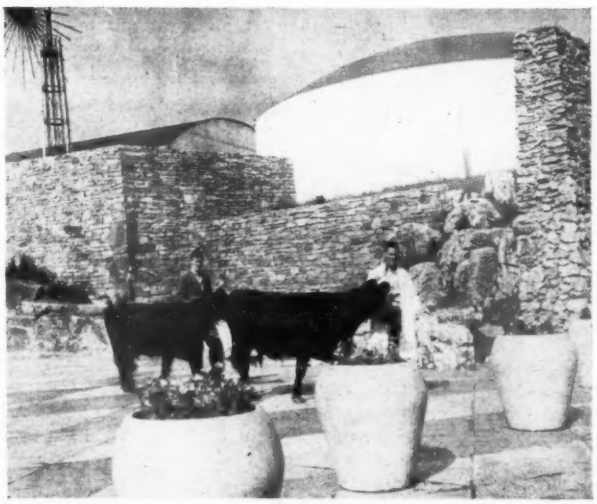
Astragal comments on the Building Research Congress this week. Above are two delegates at the Congress: left, P. K. Jørgaar, the Architectural Director of Research in the Danish National Institute of Building Research, and right, W. A. Taylor (USA), Director Department of Education and Research, AIA.

I have, unfortunately, yet another correction to make. Last week I said that the MOW had finished restoring Thomas Archer's pavilion at Wrest Park. I learn now that the repairs are not yet quite finished and that the building will not be open to the public for some time.

FOB LIGHTING RECORD

I have received a copy of the latest issue of the *International Lighting Review*, a sumptuous trade periodical published in several languages in Holland and distributed in this country by Philips Electrical. It is a special issue on the Festival lighting, and it is a particularly sparkling and courageous one in that not only are most of its illustrations night photographs but many of them are night *colour* photographs. These are no more æsthetically satisfying than most other colour reproductions but their technical brilliance is remarkable. It is pleasing to know that

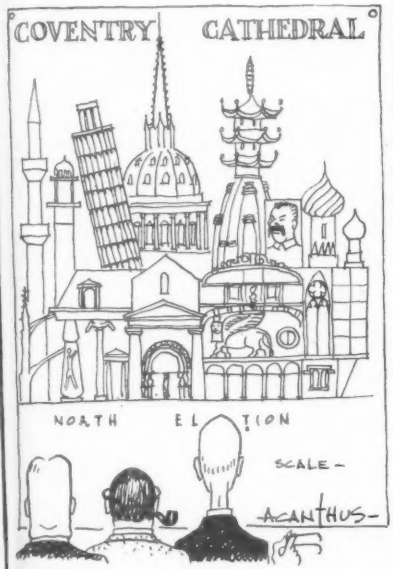
This week Astragal brightens his pages with a puzzle picture. Where was this photograph taken? The answer, which is not Arizona, and will not—out of consideration for the reader—be printed upside down at the foot of the page, is to be found in the subject for this week's leader. And if that's what you thought Astragal apologises for bothering you.



An Adventure in Town Planning

The ICA's first planning exhibition is on view at 17, Dover Street, until October 6. This exhibition, which is commented on by ASTRAGAL on page 335, consists of a series of projects for the redevelopment of London. They are the work of the Civic Design staff and students of the Polish University College School of Architecture, London, under W. K. Smigielski. Above the St. Paul's area: conception by W. K. Smigielski, N. H. Gorwic and B. Schlaffenber, and detailed planning by M. Baranowski, R. Kowalewski and W. Sieciechowicz. In the foreground are towers of offices and an exhibition hall for commercial goods. Beyond is a pedestrian way, flanked by the preserved Guildhall and offices, leading to the pedestrian precinct of St. Paul's. On the river front is a museum. The authors call this an " adventure " in town planning and say the exhibition is aimed to direct the public's attention to the almost forgotten aspect of three-dimensional design in town planning. See also page 342.

this full and permanent record of the Festival lighting has been made. Congratulations, Mr. Editor Sybren Kiers of Eindhoven!



"Pity it's so late, Maufe—it might have pleased almost everybody."

ELECTRICITY CUTS

A quiet announcement in some local newspapers, and later in the national press informed those lucky inhabitants of the area covered by the Southern Electricity Board that when their buildings now under construction, or to be constructed, are completed they will not be able to enjoy the blessings of an electricity supply. "Owing" we are informed "to the exhaustion of the money available for capital development no further connections can be made." It appears that the 1951 housing schemes will be in the clear, but any private houses not yet connected and any future work will have to be lit by candles and oil lamps and heated with gas or solid fuel, except where the Board regard themselves as "committed" though what this means is left delightfully vague.

•

In one case I know of the Board have relieved a house builder of an appreciable sum of money in return for an extension of their main to reach the house and now regret their inability to make a connection. This does not seem to be quite up to the standard required of an industry nationalized in the interests of the consumer, economy and efficiency.

ASTRAGAL

The Editors

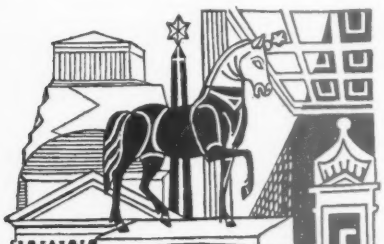
WHAT NEXT ON THE SOUTH BANK?

WITH only a week or so to go before the Festival closes, it is natural that there should be a lot of uneasiness about what is to happen next on the South Bank site. The South Bank exhibition was not only a first-rate show, but also served the invaluable purpose of demonstrating how greatly London gained by the presence of good buildings, gay colours and the coming and going of people on a site that had been derelict for generations.

It would be a tragedy if the site were to be allowed to revert to its derelict state on the closing of the exhibition, pending permanent redevelopment by the LCC, which is bound to take many years in the present economic situation. Festival year, it is true, has given us the Royal Festival Hall, and the LCC promise riverside gardens within a short while. But these will not be nearly enough to rescue the site from a return to unsightly squalour if the temporary exhibition buildings are demolished as a matter of routine before plans have been made for the short-term utilization of the site, and if MOW is allowed to start excavations for the Government offices that are to be built alongside County Hall without making sure they can be completed within a reasonable time and without first establishing their relationship with the rest of the area.

There is no shortage of ideas for utilizing exhibition buildings for a few years longer. The public, having enjoyed riverside meals in the various restaurants throughout the summer, would like to see at least one of the restaurants continued, and consideration should be given to this before they are all demolished. The Arts Council wants the Lion and Unicorn building as a gallery for loan exhibitions—a proposal well in keeping with the LCC's zoning of the South Bank as a cultural centre; the cinema industry wants to keep the Telekinema —and so on.

In addition, much of the present planting and layout—especially in the downstream section—could beneficially be made the basis of the proposed public gardens, which need not for the time being be confined to the river front, even though the latter may be the only part of the site permanently allocated for use as gardens. The LCC's own design for the riverside gardens, moreover, could well incorporate such charming features of the exhibition layout as the look-out platforms belonging to the Seaside section which provide such an admirable architectural foil to the mass of the Festival Hall. So various are the possibilities that the Government has felt obliged to set up a "working party" to study them. It is to be hoped that the "working party" will have some positive recommendations to make soon and that no demolitions will begin until a proper plan has been worked out in consultation with the LCC. Only the Government itself is in a position to reconcile competing interests and ensure that the most is made of the opportunities of the site. If it fails to do so many of the long-term advantages of the Festival will be lost.



John H. Markham, F.R.I.B.A.

Geoffrey Dunn

W. E. Wright

H. C. Harris

Hung Drawn and Quartered

SIR,—I feel bound to address to you a few remarks on the subject of ASTRAGAL'S comments appearing in your issue of June 7. There are in it comments on the scheme we are carrying out at Tower Hill for the Tower Hill Improvement Trust. My attention was drawn to these at the time the JOURNAL appeared, but it seemed as though the author did not expect to be taken seriously; and, consequently, I had no idea of interfering, though I think it regrettable that architectural journalism should bring itself into disrepute by offering to its readers flippant observations arising from complete ignorance of the subject matter treated. We did, however, laugh, as I suppose your readers were expected to do. I should not, even now, refer to the matter, were it not that your remarks have ricocheted unpleasantly on to us from many directions and information now reaches us which shows that we are likely to suffer positive detriment.

It is this which prompts me to suggest that you may wish to introduce a little sober restraint in utterances that may do positive harm to members of the profession, though I am quite sure the writer of the remarks in question had no such intention.

May I add that helpful criticism, even if severely adverse, would, I think, be generally appreciated; but for this the critic must be properly informed. In this case—leaving aside fatuities as to "precinct" and "rest"—I might point out that the so-called "privy or mustard pot" is first and foremost an emergency escape stair from vaults below (insisted upon by the LCC). The panelling out of the paving was introduced in deference to a wish expressed by the Planning Authority, and the "off the centre line of the church" is inaccurate; but I am not concerned to refute criticisms, however frivolous. I only thought that for your future guidance you would be interested to know that this sort of levity can do positive damage.

JOHN H. MARKHAM.

London

[Astragal replies:—My criticism of the design (shown right), exhibited at this year's Royal Academy Summer Exhibition, was that it did not live up to its name of "Rest Precinct." Another point was: why does the escape stair block the paths so carefully indicated by special paving? I regret that my efforts at criticism are so frivolous as to be not worthy of refuting. I further regret that such frivolity has caused Mr. Markham to suffer "positive detriment." Similar regrets must attack the conscience of theatre critics when a play which they have criticised fails to run. There is, surely, no solution to this. Getting the facts correct is not the whole answer. It is the interpretation of them in the same way as the author which is so difficult.]

Eric Ravilious

SIR,—With the South Bank Exhibition nearing its end, it is surprising to me that nowhere, as far as I know, has there been an illustration or reference to the delightful tribute paid to Eric Ravilious in the Lion and Unicorn building. I can only hope that the camera has recorded it, and that it will appear in good time, in order that the name and work of this great artist and industrial designer may be further perpetuated.

GEOFFREY DUNN

Bromley, Kent

[The photograph above shows the reconstruction of "Garden Implements"; a design by Ravilious for Josiah Wedgwood & Sons. Inset above the watering-can is the artist's original sketch.—ED.]

The Failure of Lead Soil Pipes

SIR,—I was indeed very interested to read the article in your issue of July 26, on the use of short lengths of 4-in. lead soil pipe with the requisite branches to take the place of cast iron fittings in a one-pipe plumbing installation, where the remainder of the soil pipe was in cast iron. The trouble you described would have occurred if the whole stack had been in lead. I was consulted, in a recent case, concerning a complete lead soil pipe which was giving trouble. The designer of this soil pipe had had double off-sets fixed at each floor, presumably to allow for the expansion and contraction which he quite rightly expected would take place.

I found that the failures were due to the sudden temperature changes suffered by the stack; the wc discharges being very cold and sometimes those from the bath, lavatory basin and sink being very hot. I have been instructed to remove the complete stack and replace it with one made from a more satisfactory material.

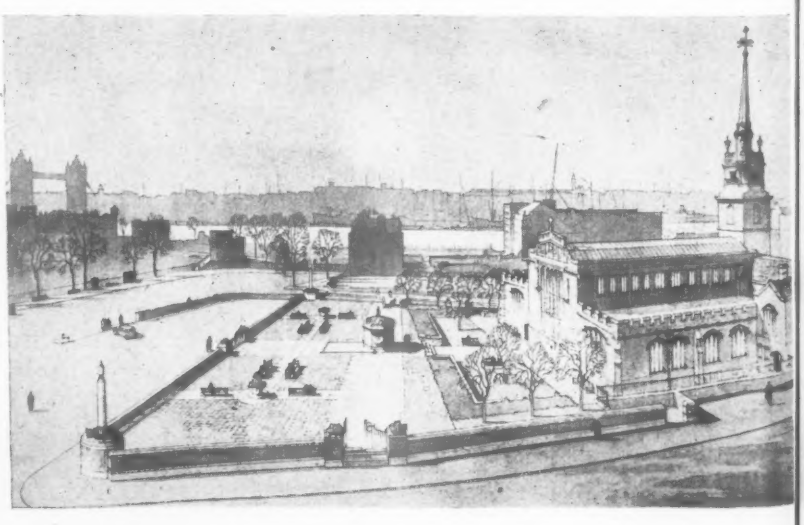
Lead does not contract as much as it expands. Having expanded, it does not return to the same size when the temperature is restored to normal. That this is true can frequently be seen in the case of a long lead bath waste tacked to the outside wall of buildings. You will find that the pipe between the tacks has sagged, with the result that instead of remaining straight, it often becomes wavy.

(The sketch referred to is reproduced here.)

In the particular case you have illustrated, it might have been possible, by the correct fixing of the cast iron pipes, to have relieved the lead sections of undue weight, and allowance could have been made for expansion and contraction in each section. The lower floor failed because it is subject to more frequent temperature changes than the sections on the upper floors.

Cast iron and steel soil pipes have a coefficient of expansion corresponding more closely to that of the building itself and, so, when such materials are used, less elaborate precautions to allow for the movement are necessary. I have designed a large number of one-pipe plumbing systems and, like other large plumbing contractors, I experienced great difficulty in obtaining the necessary cast iron fittings. The standard fittings are not really adaptable to the one-pipe plumbing system and I started making my own substitutes. Because of its durability and because of the ease of working it, I chose copper. But, realizing that its coefficient of

Below, Rest Precinct at Tower Hill. See letter from John H. Markham.



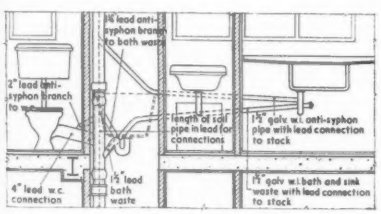
expansion is about 50 per cent. greater than that of the building, I arranged for expansion joints to be inserted at the necessary intervals at the height of the stack. It might have been cheaper to weld a copper stack complete from top to bottom but this is very bad practice. There have been one or two notorious cases of failure due to this complete welding up of the stack into one vertical vent.

I have since been fortunate in finding a firm willing to manufacture large or small quantities of soil pipe to my own design, to suit the particular building in which I may be working in. They are delivered to the site in one piece, ready for quick installation in conjunction with straight lengths of cast iron and with the wc, bath, basin and sink branches ready fixed in the position which, by erecting a prototype, was found to be the best. The firm to which I refer (and I would be pleased to give any enquiring architect its name) also make these soil pipe sets from heavy gauge steel pipe, which is galvanized inside and out after the branches have all been welded into the correct positions. I find that the installation time, using one of these preformed soil pipe sections, is considerably less than it would be if cast iron were used and the cost of the completely installed drainage unit is, of course, very much below that of a similar one in lead besides being more durable and less free from the trouble which you pointed out to your readers.

The only thing to be done with the troublesome mixed installation which you describe in your issue, is to take out each of the lead soil units and replace it with a prefabricated steel or copper one. I would like to warn your readers, however, that, if steel is chosen as a substitute material, they should do as I do and recommend the use of an insulating nipple which will prevent the electrical contact between the zinc coating of the soil stack and the copper pipes which lead into it.

W. E. WRIGHT

Birmingham



SIR,—There would appear to be some contradictory statements in the description of the possible cause of this unusual occurrence. 1, The work was performed satisfactorily; 2, the stacks were supported; 3, the weight of the stack was one of the factors causing the pipes to fail; 4, the failure was due etc., to hot water from bath wastes. The example as reported suggests to us that the design is quite practicable, the choice of materials reasonable, but that proper recognition of the physical limits of lead was lacking when fixing the vertical cast iron pipes. It is, in our view, reasonably certain that if the cast iron pipe had been properly and separately supported, and some support given to the vertical lead pipe, the installation would give satisfactory service.

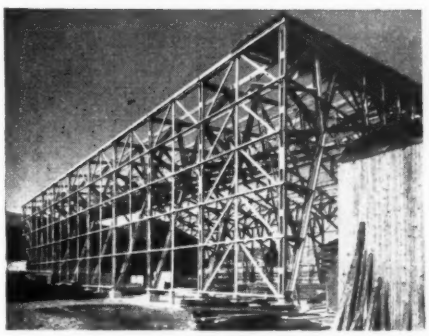
H. C. HARRIS

Lead Technical Information Bureau of the Lead Industries Development Council

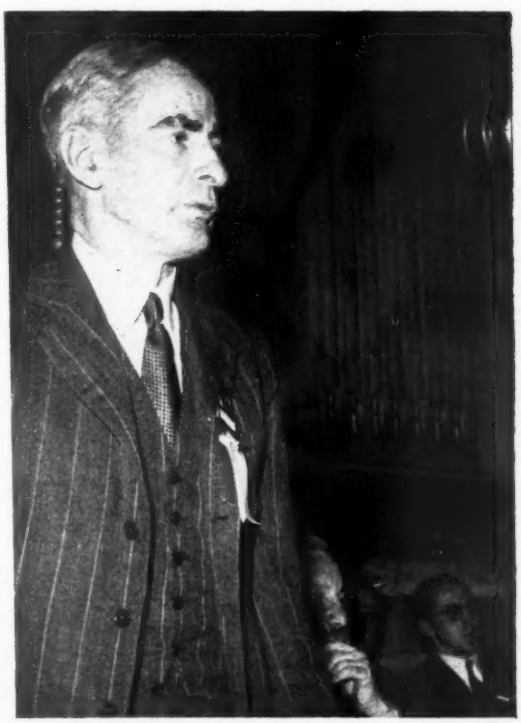
London

[Both writers of the letters above are referring to an account in the Current Technique feature in the JOURNAL of July 26, 1951, page 114. The feature described an unusual failure of lead soil pipes.—ED.]

TIMBER STORAGE SHED AT SHOREHAM

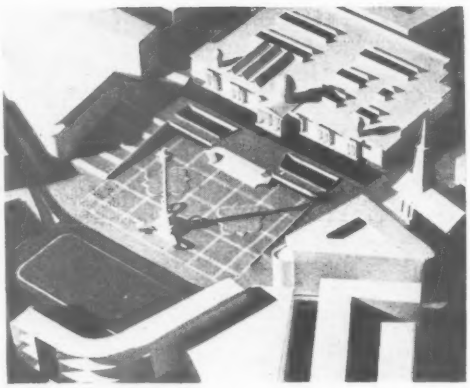


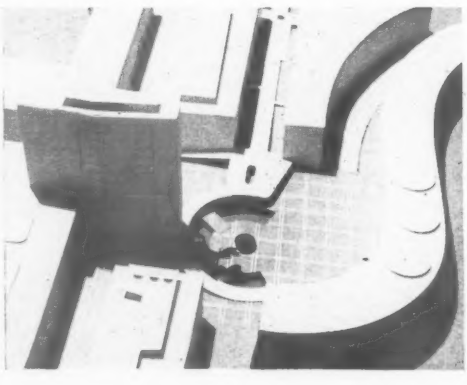
In 1949, a storage shed (span 87 ft.) was erected at Shoreham, to demonstrate the possibilities of timber as a modern structural material. A 105-ft. span extension (left) was completed recently, using 3-pin portal frames (above). All timber was stress graded. Cost was only 3s. 3d. per cu. ft.



This week's Technical Section (page 353 onwards) deals with the Building Research Congress which closes in London today. The Congress was opened at the Institute of Civil Engineers on September 11 by Lord Samuel, the president, who is seen in the centre of this picture, and the first speaker (shown here) was Dr. F. M. Lea. On the right is K. Alsop, secretary of the organizing committee of the Congress. See also news item on page 342.

LONDON OF THE FUTURE EXHIBITION





Three of the fourteen designs for the future development of London, prepared by the Civic Design Staff and students of the School of Architecture, Polish University College, London, which are now on view at the ICA Gallery in Dover Street. Above, rehabilitation of the South Bank, by W. Henneberg and M. Mlek, with extension of the Port of London on the left, high blocks of flats in the background and offices and cultural buildings on the river bank. Bottom, project by T. Zawadzki for Piccadilly, with high level pedestrian way over the street. Through traffic goes underground. Centre, plan by K. Kapolka for linking Trafalgar and Leicester Square with a pedestrian way.

BUILDING RESEARCH

Opening of Congress

The opening session of the Building Research Congress, 1951, the first international congress of its kind, took place in the Great Hall of the Institution of Civil Engineers. After reading a message from the King, sent from Balmoral Castle, the president, Lord Samuel, gave an address of welcome to the 1,200 members and delegates from more than 50 countries.

The meeting continued with a speech by Dr. F. M. Lea, Director of Building Research DSIR. He said that experience in research pointed to the need for integration of results. Like many other branches of applied research serving a broad field of industry, it did not split neatly into the formal divisions of the sciences. The combination of modern technology and traditional method in the building industry was an uneasy process in which there were many pitfalls. The means by which the time-lag between research and application could be reduced were of vital concern. With divided responsibility collaboration was essential if branches were not to find very human reasons for failure to secure collective advance.

The meeting concluded with some brief remarks by Alister McDonald, the chairman of the Organising Committee.

RESEARCH COMMITTEE

Discussion on International Collaboration

At the second meeting of the Building Research Organizing Committee, which was held at Skindles Hotel, Maidenhead, from September 6 to 10, existing arrangements for international collaboration were examined, three subjects for immediate investigation were chosen and note was taken of the first edition of a *Directory of Building Research and Development Organizations in Europe*, a UN publication.

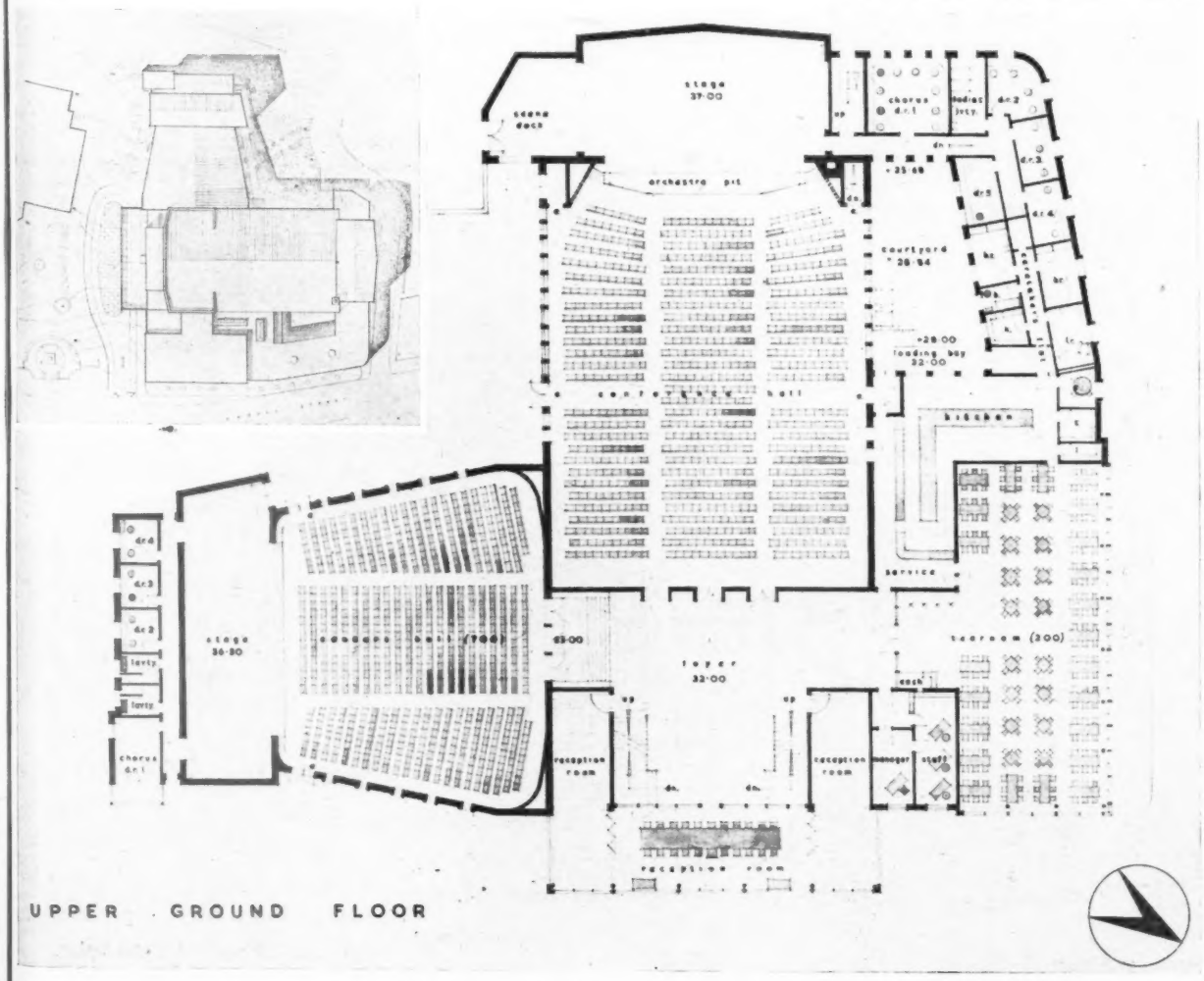
It will be remembered that the Committee, which consists of representatives of seven countries and seven non-governmental international organizations, under the chairmanship of R. Fitzmaurice, is a subsidiary organ of the United Nations Economic Commission and was appointed to examine the need for—and possible nature of—new arrangements for international collaboration in building research.

A thorough survey of the work of each international organization in the field of building research had been prepared as a

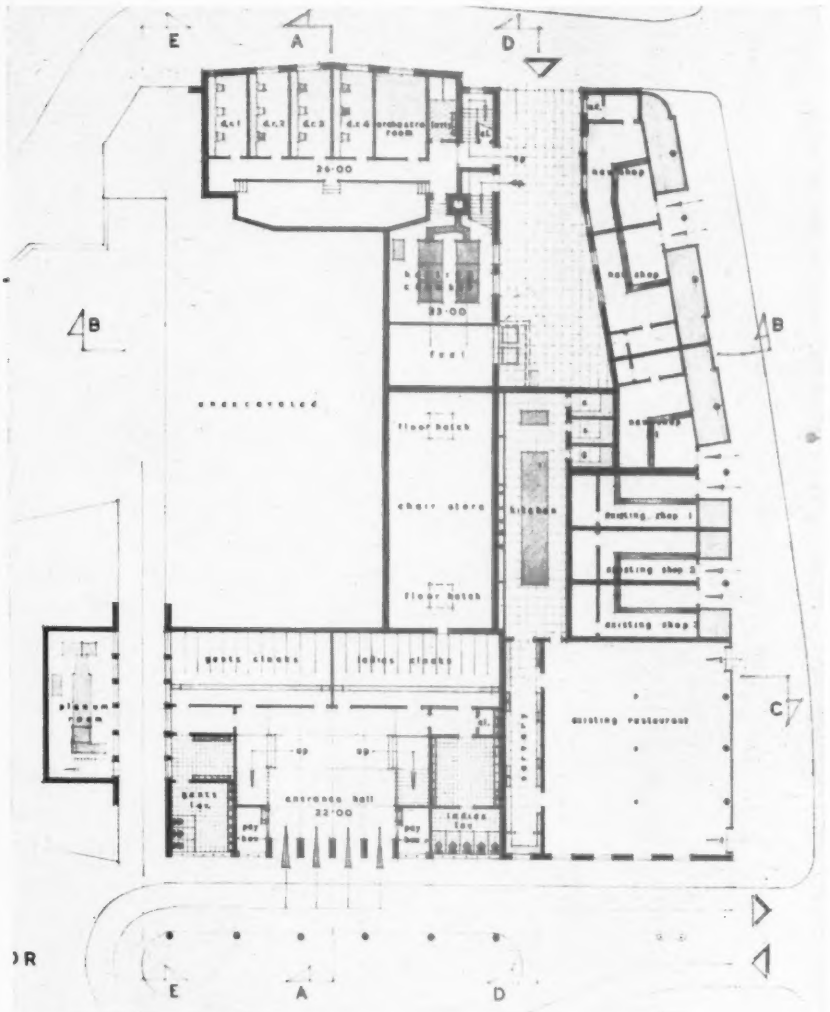
WINNING DESIGN FOR THE DUNOON PAVILION COMPETITION

The limited competition for a new pavilion and concert hall at Dunoon, promoted by the Town Council of the Burgh of Dunoon, and assessed by A. Graham Henderson, President, RIBA, was won by Ninian Johnson, of Glasgow, with the design shown here and on pages 344-5. *Six firms were chosen to compete, being selected, by Graham Henderson, with a view to giving an opportunity to junior firms in south-west Scotland.*

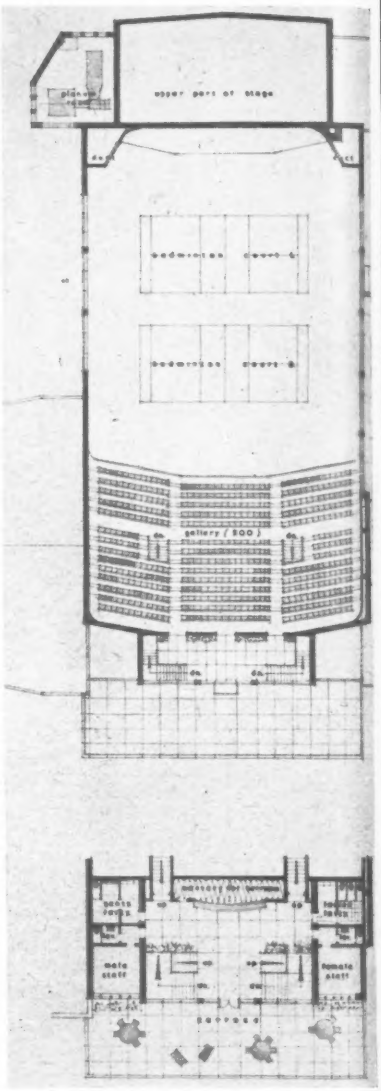
Upper ground floor plan, and, inset, site plan



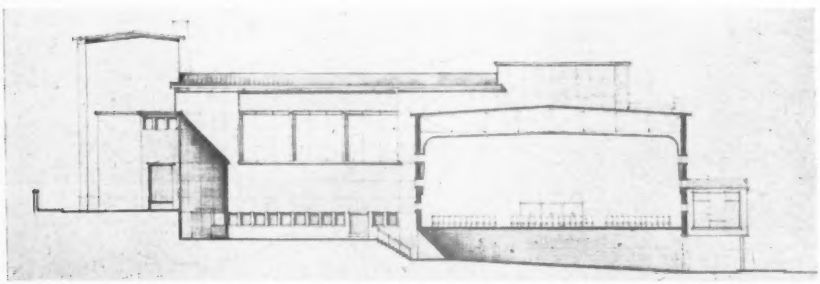
DUNOON PAVILION AND CONCERT HALL COMPETITION: WINNING DES



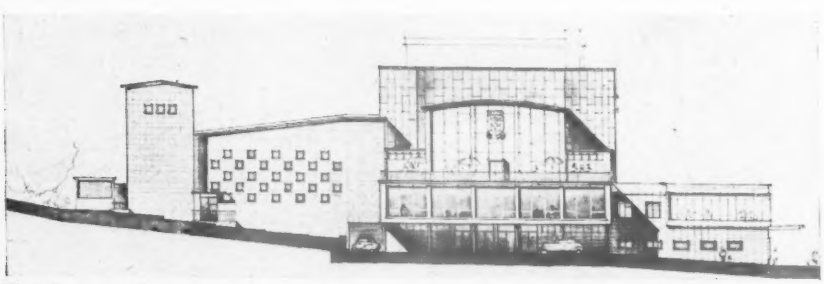
Lower ground floor plan



Entresol, and top, gallery floor.



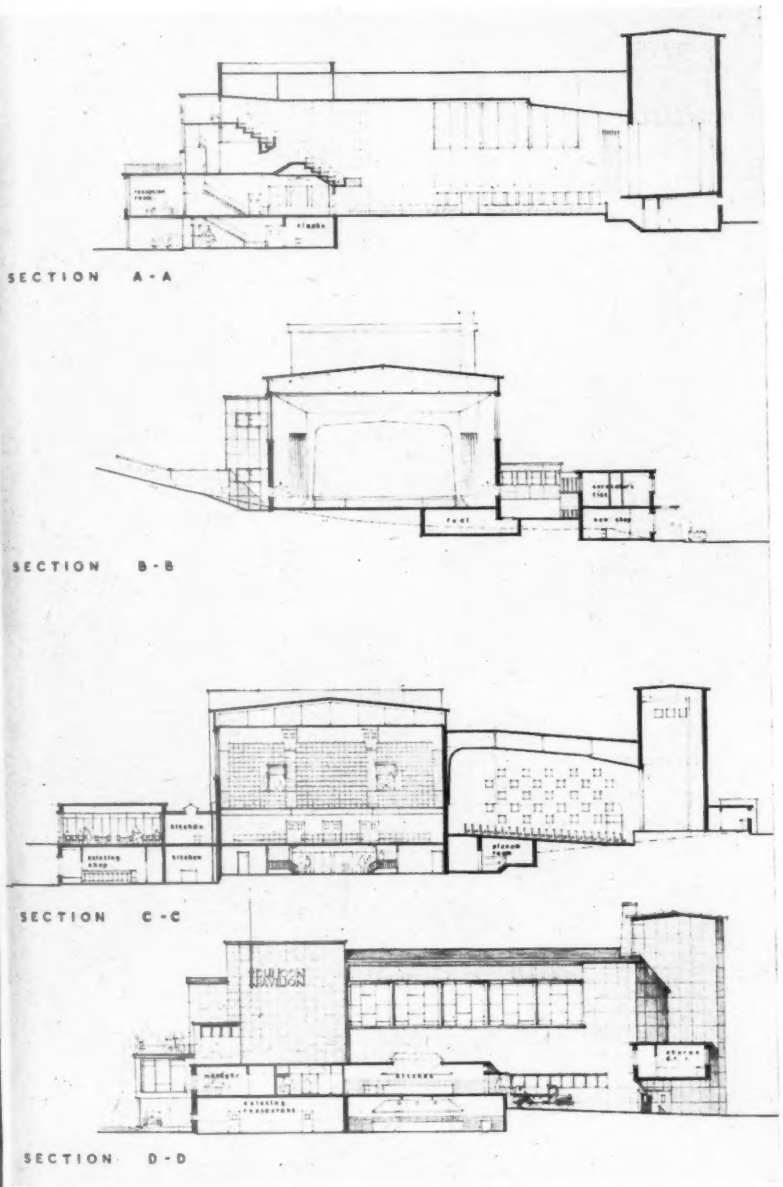
Section E-E



Elevation to gardens

The existing pavilion in Dunoon was recently partly destroyed by fire. The same site, the most prominent one in the town when viewed from the sea, is to be used for the new pavilion. The following accommodation was required to be provided :—A main conference hall of about 7,000 sq. ft., for dancing and badminton, with a balcony to seat 500. A lesser hall, of 4,200 sq. ft., to seat 700, to be used for concerts. A tea-room, seating 200, and kitchen. Shops on the street frontage, and the requisite cloak-room and lavatory accommodation.

DESIGN BY NINIAN JOHNSON



The assessor, A. Graham Henderson, comments :—"This is a very able design and its particular features are (1) it encroaches least on the Castle Gardens area ; (2) it provides easy and convenient access both for those arriving on foot and in cars. In particular, the cover provided for car entry is a good feature ; (3) the disposition of the three major elements, large hall, concert hall and front buildings, is such that they can be built separately, although obviously the large hall and front buildings should, if possible, be built together ; (4) its general architectural treatment is suitable for, and suggestive of, the uses to which the buildings are to be devoted ; (5) the spacious nature of the main crush hall which leads to the three main apartments to be used by the public and the direct and dignified approach to these apartments. There are minor defects in this design—in particular, the arrangement of gallery in the main hall which is placed wholly at one end, but I am satisfied that such defects as the design has will far outweigh its general merits relative to the other designs submitted."

basis for discussion at the recent meeting. The report of this survey stated that "the most important aspects of building research which at present the subject of systematic or effective arrangements for international collaboration are research into concrete and other building materials through the Union of Laboratories, research into illumination organized by the International Commission on Illumination, and research into soil mechanics arranged by the International Society of Soil Mechanics and Foundation Engineering. This leaves a large, indeed the greater part of the field of building research as a whole not covered by any effective arrangements for international collaboration. Important examples which can be cited are the whole field of building methods and operations, building design, and large parts of such fields as building structures, user requirements, town planning and building economics."

Subject to small amendments in detail, the Committee accepted the report prepared as a fair statement of the existing arrangements for international collaboration and of the manifold gaps in the existing arrangements.

The three subjects chosen on which international collaboration should begin right away were:—(1) The volume of habitable rooms, with particular relation to ceiling heights; (2) the use of common flues venting several heating appliances in multi-storey dwellings, and (3) the studies of the economy of multi-storey dwellings in terms of variations in height and width on plan.

The Committee considered that the subjects chosen would be very suitable as a test of methods of international collaboration, as many fields of research activity would have to take part.

The way is now clear for an examination by the Committee of the need for new international arrangements for collaboration and the nature of such arrangements. This task will be undertaken at the next meeting of the Committee to be held in Geneva next March.

HOUSING

Figures for July

The number of permanent houses completed in Great Britain in July was 15,965. This is 1,238 less than the figure for June. The number of houses completed under the post-war programme is now 1,086,715 (929,569 permanent and 157,146 temporary).

AA

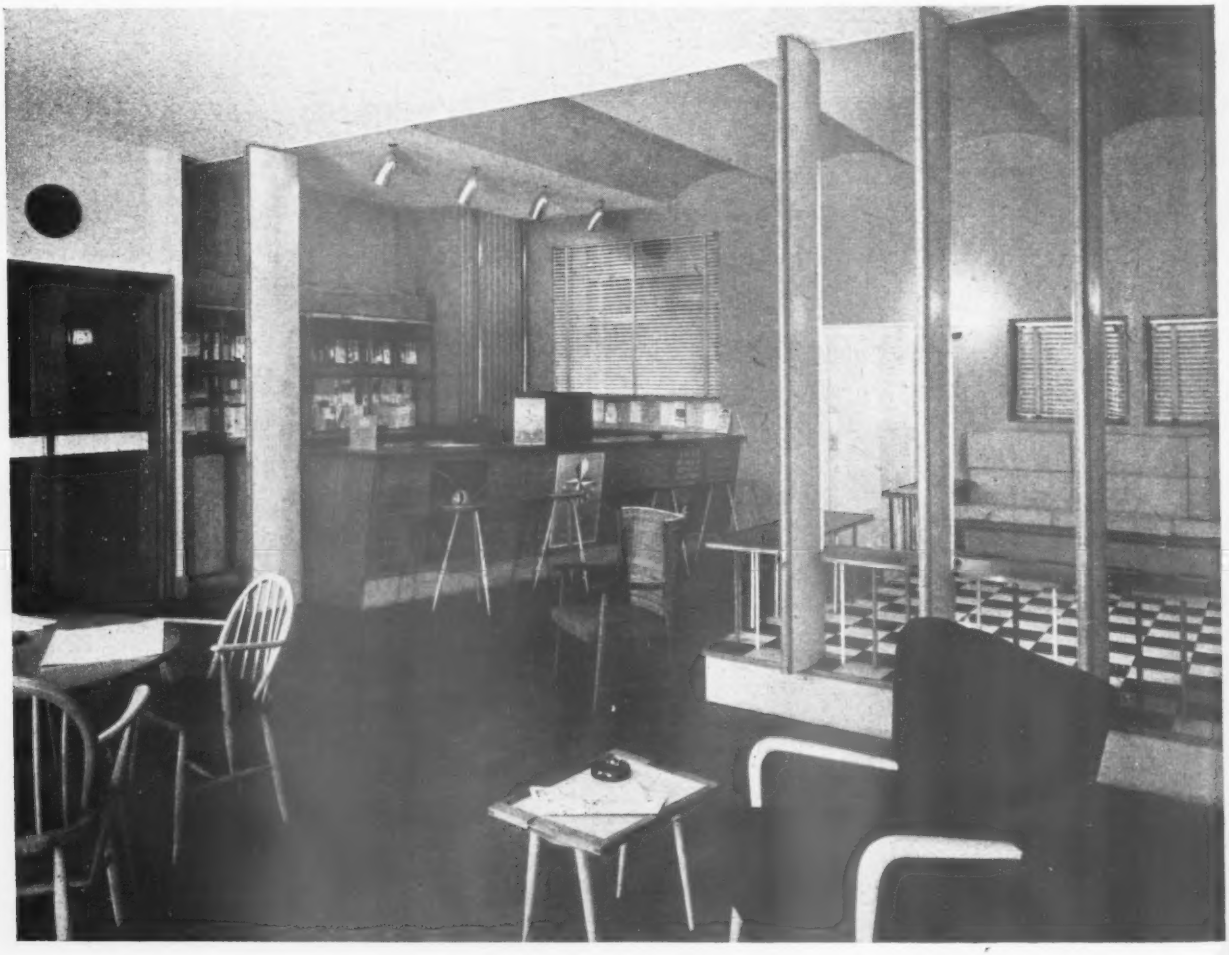
Symposium on College Design

The success of the Symposium on Hospital Planning, held in December, 1950, has encouraged the AA Council to organize a second Symposium to be held at 134, Bedford Square, W.C.2, on Wednesday, November 14, this time on the subject of "The Design and Planning of Colleges for Further Education." The meeting will again last for one day, from 9.30 a.m. until 6 p.m. Architects and educationalists will speak on various aspects of the subject and take part in discussions.

A summary of the papers will be circulated to those attending, who are advised by the AA to consult the Ministry of Education Bulletin No. 5. Accommodation is limited. Members should make early application for places, and those wishing to bring non-member guests specially interested in the subject are asked to submit their names at the same time. The fee for members and their guests will again be one guinea each.

FESTIVAL OF BRITAIN PRESS AND RADIO CLUB : AT GREAT

This club is housed in two floors of a building converted for the purpose by Hilton Wright, who was also responsible for the decorations. Left : the main bar, on the first floor. John Morton and Tom Lupton, who were associate architects for this, also designed the fixed seating and some of the bar furniture. The dining recess to the left of this picture indicates the view point from which the photograph, top right, was taken. Lucien Day designed the curtains. The wallpaper has sage and olive green stripes. Below is the main room on the ground floor. The information desk was originally designed as a bar. The photograph, centre, right, shows part of the ground floor lounge. Its window overlooks a courtyard leading into Great



SCOTLAND YARD

Scotland Yard. The upholstery is navy blue and the deep red wallpaper was printed in flock. Lampshades are of pleated paper. Another part of this lounge (bottom) has a raised bar with cork flooring. The tables on the steps, which

are fixed in place, are painted in different colours. The smaller tables beyond, designed by Nigel Walters, have removable tray tops which can be replaced by cushions. The basket backed chair was specially designed for the club by Tom Lupton.

DIARY

Symposium on Prestressed Concrete Statically Indeterminate Structures. At 52, Grosvenor Gardens, S.W.1. (Sponsor, CCA).
SEPT. 24 TO 25

The Reconstruction of Rotterdam. Speakers: J. Meertens, J.P., van Bruggen, J. A. C. Tillema, C. van Traa, A. Bos. (Sponsor: HC.) At 13, Suffolk Street, S.W.1. 5.30 p.m.
SEPT. 25

18th Annual Conference of Smoke Abatement Society. At Blackpool. (Details from Society, Chandos House, Buckingham Gate, S.W.1.).
SEPT. 26 TO 28

London: An Adventure in Town Planning. Exhibition of work by Assist. Professor Smigielski, staff and students of the School of Architecture, Polish University College. At ICA, 17-18 Dover Street, Piccadilly, W.1. Weekdays 10 a.m. to 6 p.m.
UNTIL OCT. 6

Exhibition of British Popular and Traditional Art. Sub-title: Black Eyes and Lemonade. At the Whitechapel Art Gallery. Daily except Mondays, 11 a.m. to 6 p.m. Sundays, 2 p.m. to 6 p.m.
UNTIL OCT. 6

Exhibition of Architecture. Sponsored by the Institute of Registered Architects. The above exhibition will be on view at the following places:—Mile End Library, Stepney (until Sept. 22): East Finchley Library (Sept. 24-Oct. 6); Thomas Parsons Showrooms, 70, Grosvenor Street, W.1. (Oct. 8-19); Council Office, Surbiton (Oct. 22-27); Building Exhibition, Olympia (Nov. 14-28.)

ERNEST WATKINS

The Architect and Current Affairs

Architects, particularly in private practice, live in a world of contract. Apart from the main contract, they are surrounded by a host of others, with contractors and subcontractors. Today, most of these contracts are based on standard printed forms, adapted to the circumstances of each case. Occasionally, the adaptation is imperfectly done. Sometimes there is a gap left in the provisions, sometimes there are discrepancies between one section of the print and another, and sometimes there is a conflict between what is printed and what some party claims was said and agreed at the time.

A recent decision in the Court of Appeal shows the legal rules governing that last situation. A cattle dealer put up some Guernsey cattle for sale in the market. The auction catalogue contained a printed clause which read: "No animal . . . is sold with a warranty unless specifically mentioned at the time of offering, and no warranty so given shall have any legal force or effect unless the terms thereof appear on the purchaser's account." Bidding for one animal hung fire and before any bids were made the owner stated he would absolutely guarantee her in every respect and that he would be willing to take her back if she turned out not to be what he stated she was. The animal was sold for £65. Four months later it had died from tuberculosis. The buyer claimed back the £65. The seller pleaded, first, that he had not given any warranty (his evidence on that was not accepted by the judge) and, secondly, that the buyer had no legal right to claim because of the printed clause in the auction catalogue.

The Court of Appeal confirmed the buyer's right to recover the £65. In substance it held that the contract under which the animal was sold came into existence only after the seller had, in effect, said, "The animal will be sold on the faith of the verbal statements I have made, to the exclusion of anything in the printed form which would seem to rule out any verbal statements." In other words, it may be that the words and actions of the parties themselves during the making of the contract show that a particular printed clause, apparently a part of the contract, was never intended to be included. A quotation from the judgment of Lord Justice Denning sets out the general position of those who wish to rely on printed notices and conditions: "A party who is liable at law cannot escape liability by simply putting up a printed notice, or issuing a printed catalogue, containing exempting conditions. He must go further and show affirmatively that it is a contractual document and accepted as such by the party affected. This was not the case with this catalogue."

A COMMON CONTRACT PROBLEM

A second recent decision in the Court of Appeal illustrates another point on contract not infrequently encountered. One party, say the owner of a building, has some work done for him in the building. It is done badly someone suffers injury as a consequence, and the building owner is faced with a claim for damages. He settles the claim and then calls on the person whose negligent work was responsible for the injury, to pay over the amount he himself has paid out. How far can he say, "I acted reasonably in settling that claim. It is not open to you to question what I did. You are bound to pay over the amount I paid out, as representing the damage I suffered through your negligence." Or, to put it another way, if one party bases his claim on a settlement he has made, can the other party challenge that settlement and demand that the person who made it prove all over again how it was arrived at?

This case concerned some bitumous adhesive mastic sold to the Dutch Government. It was defective and the claims based on the defects were agreed to, during the course of an arbitration, at £43,000 and costs. The intermediaries then claimed the £43,000 and costs from the suppliers, basing their claim on the fact that that was the amount paid to the Dutch Government under legal advice. The judgment of the Court can be given in the headnote to the case: "The party making the settlement must show not merely that he acted reasonably in settling the claim against him, but also that the settlement arrived at was in itself reasonable; but the Judge at the trial must consider the evidence, and if he came to the conclusion that, in the circumstances, the settlement was reasonable the amount paid in settlement by the plaintiff was the measure of damage recoverable by the plaintiff from the defendant.

Finally, I have been given the report of a case in a county court in the Midlands, one which is in very much the same territory. It raised no principle; its application is practical. A firm of flooring contractors sold and installed in a motor showrooms a floor of plastic tiles. Unfortunately, after the tiles were laid it was found that they took the imprint of the tyres of cars standing on them, while, if petrol were spilt, it marked the tiles where it dripped. When the flooring contractors claimed for their bill, the owners of the showrooms counterclaimed for the cost of replacing the floor, and for loss of the use of the premises while the replacement work was being done. The decision went in favour of the showroom proprietors. The moral of this story would seem to be: "Don't specify a particular article for a job unless you know all about both and the article and the conditions it will have to face in service." This would seem straightforward advice, but —.

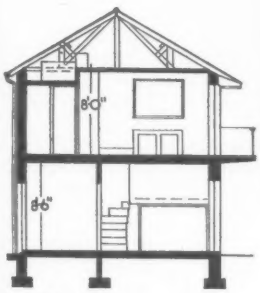
HOUSE

in NORTH END, HAMPSTEAD HEATH, LONDON N.W.3
designed by the ARCHITECTS' CO-OPERATIVE PARTNERSHIP

A small house was required for the client and her husband, who designed it particularly for ease of running and the maximum feeling of space inside. The site consists of a plot approximately 70 ft. square at the end of a long narrow garden belonging to the client's parents. The type of plan used claims to provide privacy where necessary, and yet condenses space which is needed purely for circulation to less than 2 per cent. of the floor area.

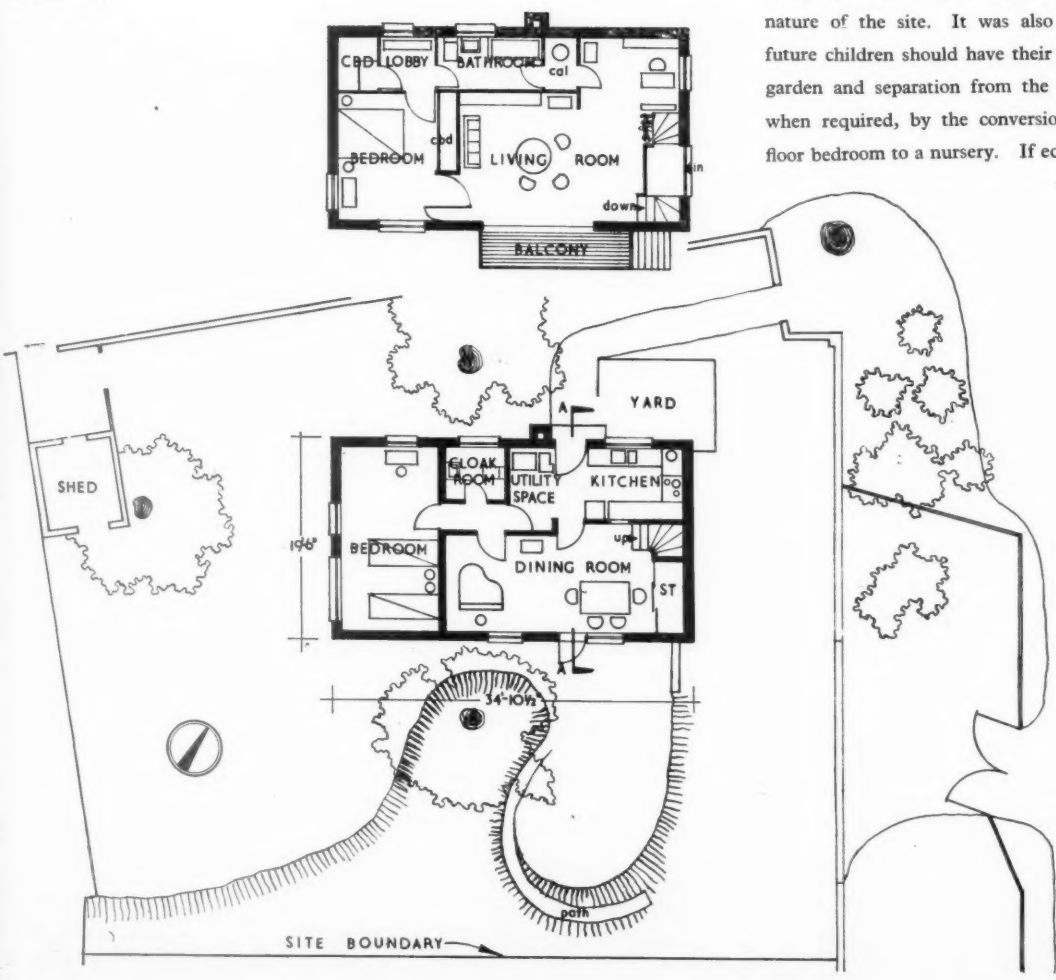
The garden front looking north-west.

The first floor living room and balcony, with outside stair to the garden on the right and staircase to the ground floor on the left.



Section A-A

PLAN.—The plan was kept as free as possible within the limitations of the structure, with the living room on the first floor due to the enclosed nature of the site. It was also desired that any future children should have their own access to the garden and separation from the rest of the house when required, by the conversion of the ground-floor bedroom to a nursery. If economic conditions



Ground and first floor plans and site layout [Scale: $\frac{1}{16}$" = 1' 0"]

View from the garden looking north.

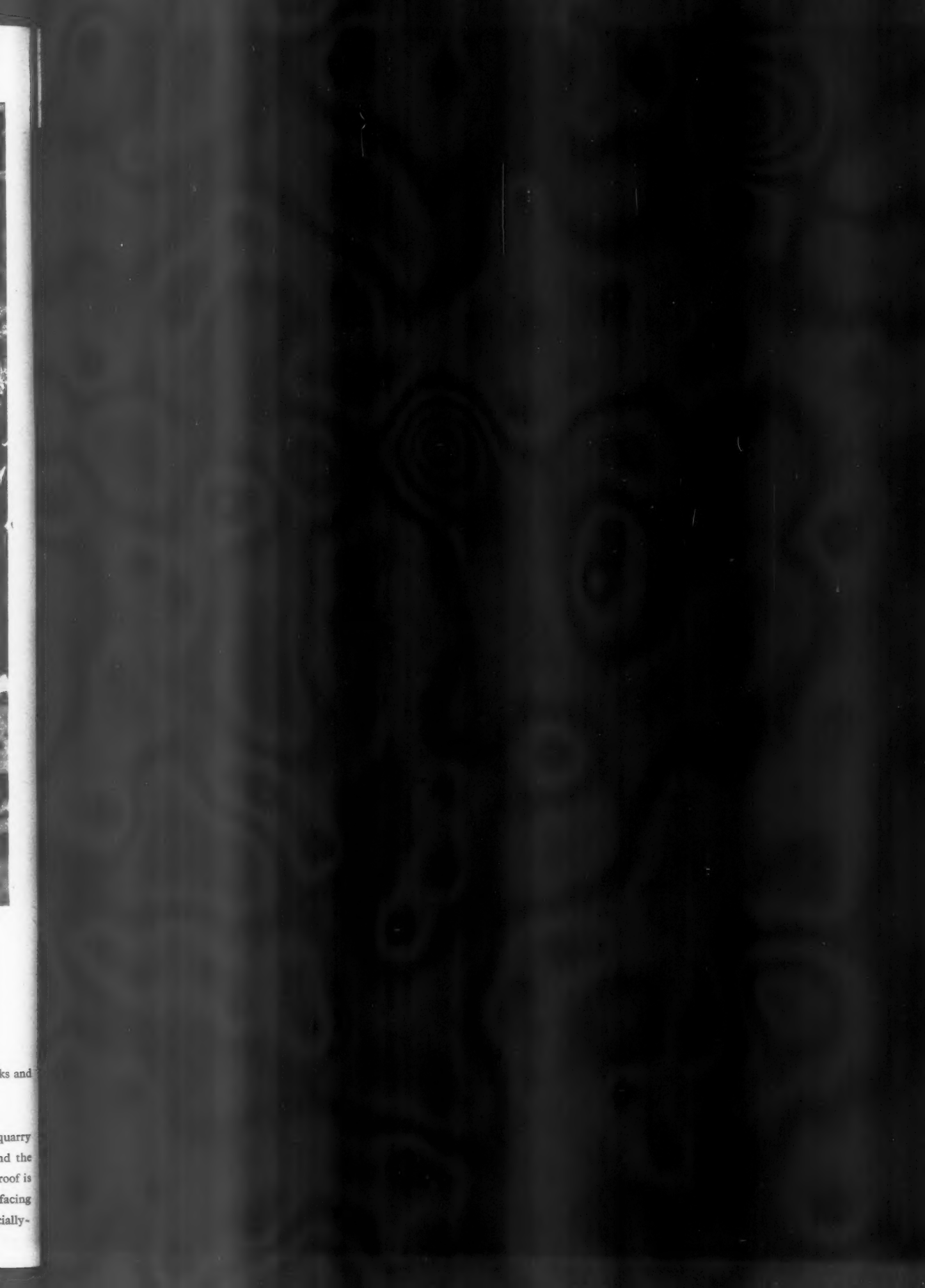
HOUSE

in NORTH END, HAMPSTEAD HEATH, LONDON N.W.3
designed by the ARCHITECTS' CO-OPERATIVE PARTNERSHIP

had allowed, the architectural expression would have been very different, with the use of a lighter form of construction.

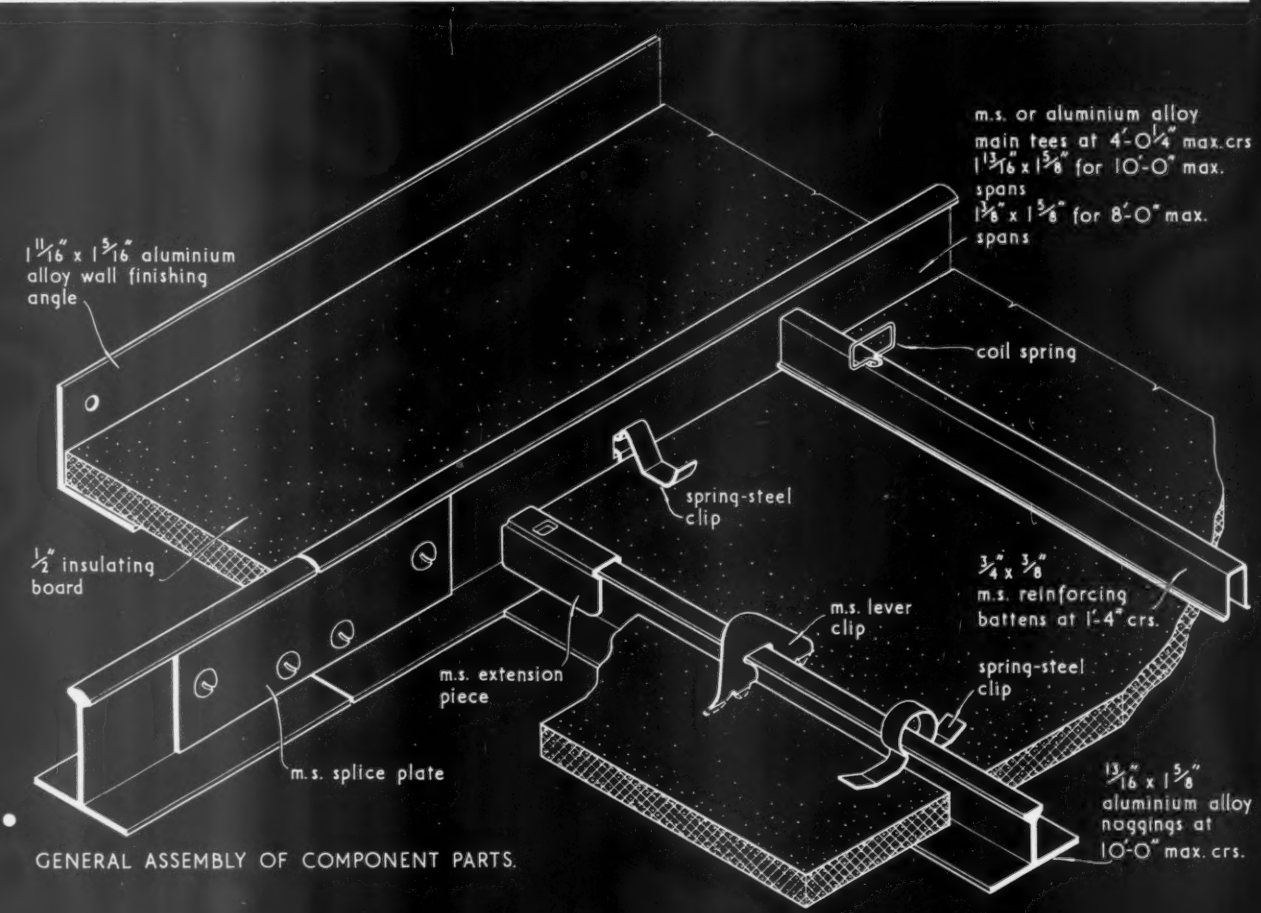
CONSTRUCTION.—There are 11-in. cavity load-bearing walls with a 4½-in. brick outer leaf and a 4½-in. breeze inner leaf. The first floor is of lattice steel joists carried out on the south-east facade to support the balcony. Partitions are of breeze blocks and the roof is of timber trusses.

FINISHES.—Corrugated iron, screed and quarry tiles are laid on the first floor lattice joists and the ground floor ceiling is of plaster board. The roof is covered with blue-grey Penrhyn slates and the facing bricks are buff-yellow in colour. The specially-

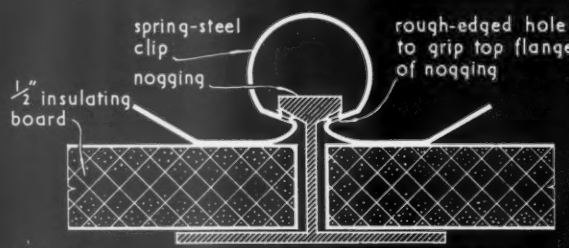


CEILINGS | BUILDING BOARD

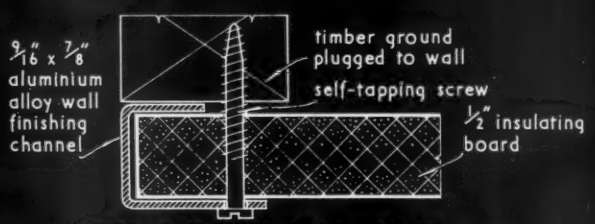
The Architects' Journal Library of Information Sheets 329. Editor: Cotterell Butler, A.R.I.B.A.



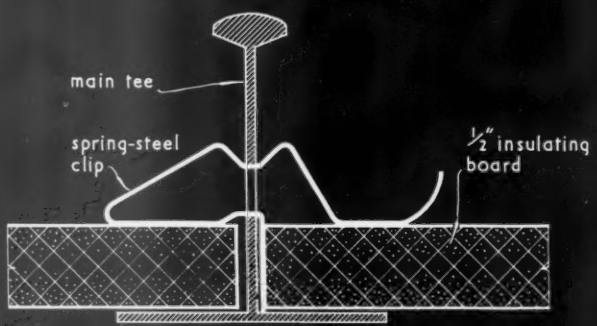
GENERAL ASSEMBLY OF COMPONENT PARTS.



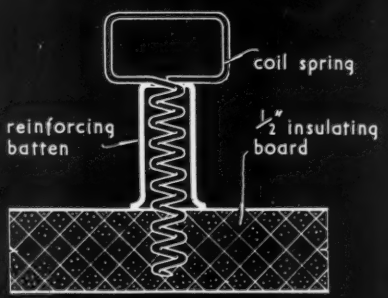
CLIP FIXING BOARDS TO NOGGING SECTION.



ALTERNATIVE WALL FINISHING SECTION.



CLIP FIXING BOARDS TO MAIN TEE SECTION.



COIL SPRING FIXING REINFORCING BATTEN TO BOARD.

FULL-SIZE DETAILS.

·TENTEST· 4FT. PANEL SYSTEM OF BOARD FIXING FOR SUSPENDED CEILINGS.

Manufacturer: Tentest Fibre Board Co. Ltd., Specialised Construction Department.

22 D14 · TENTEST · 4FT. PANEL SYSTEM OF BOARD FIXING FOR SUSPENDED CEILINGS

This Sheet describes a system of board fixing which combines the use of Tentest insulating board with steel or aluminium alloy supporting members.
The system is mainly applicable to flat or curved ceilings.

General System

The boards are carried on tee sections which are slotted at approximately 9-in. intervals to take spring-steel fixing clips which hold the boards in position. All sections are flush-jointed on the underside and mild-steel reinforcing battens, fixed at approximately 1 ft. 4 in. centres to the top surface of the boards, prevent the boards from sagging. The board is trimmed at the walls by means of an aluminium-alloy angle section plugged and screwed direct to the wall face or by a channel section screwed from the underside to a timber ground.
The main tees are supported on clips or strap hangers suspended from the main structure at not more than 10-ft. centres.

Components

Main tees : These are of extruded aluminium-alloy or cold rolled steel and are available in two sizes—$1\frac{11}{16}$ in. for 10-ft. maximum spans and $1\frac{1}{8}$ in. for 8-ft. maximum spans both sections having flanges $1\frac{5}{8}$ in. wide.

Main tee splice plates : These are of steel and are used for jointing the main tee sections.

Noggings : These are of aluminium alloy and measure $\frac{11}{16}$ in. by $1\frac{5}{8}$ in. They are fitted at either end with mild-steel extension pieces which rest on the flanges of the main tees.

Reinforcing battens : These are of mild steel and measure $\frac{1}{4}$ in. by $\frac{3}{8}$ in. They are fixed to the top surface of the boards with coil springs (see detail) at 9-in. centres and run parallel to the noggings. The battens are fixed to the boards before the boards are lifted into position.

Clips : Spring-steel clips in conjunction with mild steel lever clips are used, as shown, to secure the boards to the main tees and noggings.

Wall finishing angle and channel : These are of aluminium alloy and measure $1\frac{11}{16}$ in. by $1\frac{1}{16}$ in. and $\frac{7}{8}$ in. by $\frac{5}{16}$ in., respectively.

Insulating Boards

Tentest standard insulating boards $\frac{1}{2}$ in. thick are fixed in lengths of up to 10 ft. by 4 ft. wide.

Finish

The aluminium-alloy sections are normally supplied in their natural finish.

Sound Absorption

$\frac{1}{2}$-in. Tentest insulating board has a sound absorption coefficient of 0·30 at 500 cycles per second.

Thermal Insulation

The thermal conductivity coefficient (k) of Tentest insulating board is 0·37 B.Th.U./sq. ft./hr./1°F./in. thickness.

Acoustic Boards

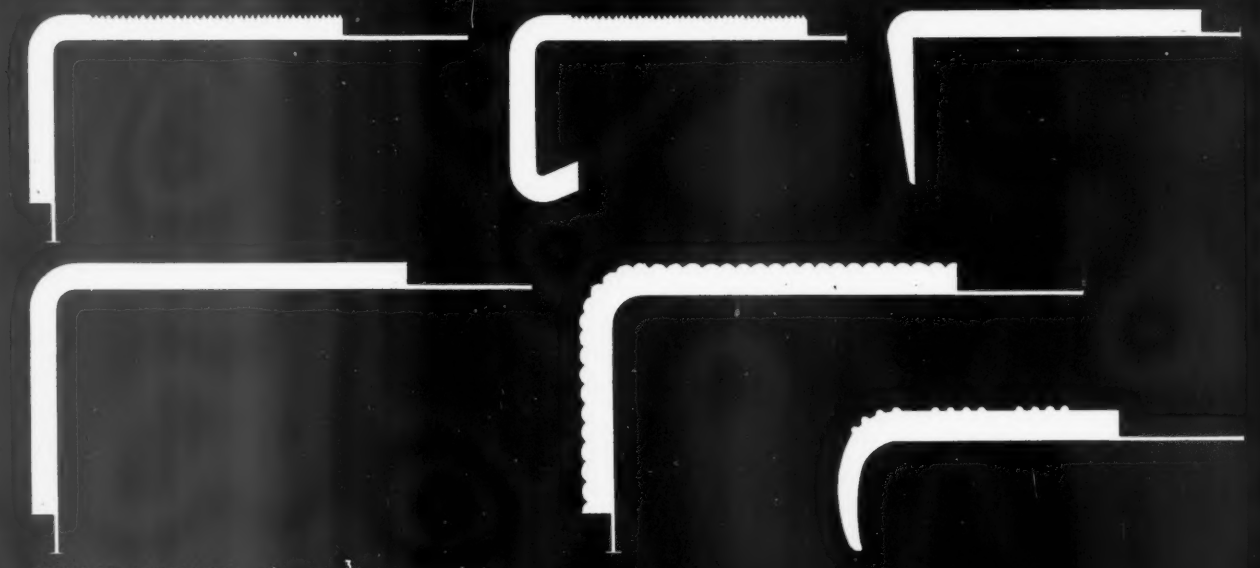
Perforated acoustic tiles and the Tentest Company's "Rabbit Warren" S.C. acoustic board (in sizes up to 10 ft. by 4 ft. wide) can also be fixed by this method. Details are given on Sheet 27.B1.

Compiled from information supplied by :

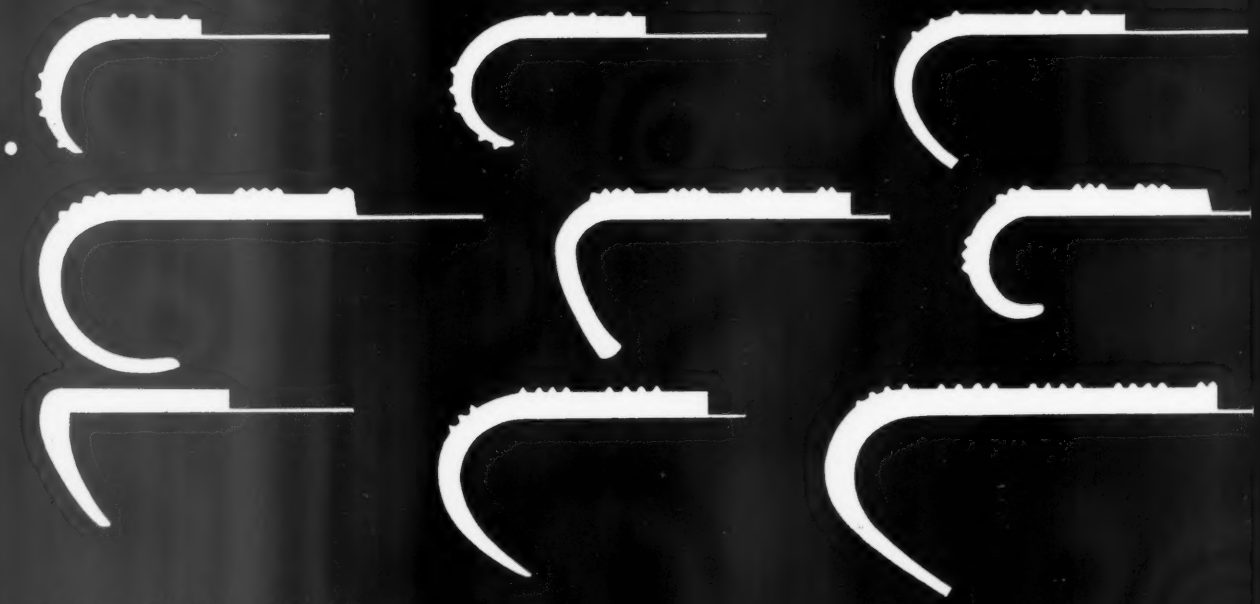
Tentest Fibre Board Co., Ltd., Specialised Construction Dept.
Head Office : 75, Crescent West, Hadley Wood, Barnet, Herts.
Telephone : Barnet 5501 (5 lines).
London Office : 18, Pall Mall, London, S.W.1.
Telephone : Whitehall 9366

FLOORS FINISHES | RUBBER

The Architects' Journal Library of Information Sheets 330. Editor: Cotterell Butler, A.R.I.B.A.



SQUARE NOSINGS. (scale 3/4 full size)



ROUND NOSINGS. (scale 3/4 full size)

COMBINED TREADS, NOSINGS AND RISERS. (scale 3/8 full size)

RUBBER STAIR TREADS, NOSINGS AND RISERS.

Compiled from information supplied by The British Rubber Development Board.

19.F2 RUBBER STAIR TREADS, NOSINGS AND RISERS

This Sheet describes various rubber stair treads, nosings and risers. The nosings may be used with rubber or any other sheet flooring and are selected from the wide range which is available. Nosings may be either smooth-surfaced or ribbed.

General

Rubber nosings may be obtained to fit treads of any normal depth or thickness, any projection and shape of nosing and any width of stair.
Nosings of any section may be formed to fit the contours of curtail steps or other features.
Separate treads, risers and nosings are especially recommended in cases of heavy traffic as they enable the nosings alone to be replaced when they become worn.

Square Nosings

These may have rubberised canvas flanges to fit under the tread and in some cases the riser as well. Alternatively the nosing may be returned to butt against the riser, or tapered or moulded to meet the riser.

Round Nosings

These may have rubberised flanges to fit under the tread and a variety of mouldings is obtainable.

Combined Treads, Nosings and Risers

The drawings at the bottom of the Sheet show some typical sections which can be made to order.

Preparation of Surfaces

Similar sub-structure conditions are required to those specified for rubber floors. See Sheet 19.F1.
Mouldings under nosings should not be fitted to new staircases and it is advisable to remove them from existing staircases.

Laying

Before laying the rubber, the stairs should be made smooth, clean and dry. The adhesive should be applied to both the stair surfaces and rubber in accordance with the rubber manufacturer's or laying contractor's recommendations. The adhesive should be allowed to become substantially dry and tacky before the rubber is laid in position.
When placing the rubber in position the surface should be smoothed out and particular care taken to avoid the trapping of air.

Adhesives

Details regarding adhesives are given on Sheet 12.N1.

Colours

Treads and risers can be supplied in a wide range of plain or marbled colours. Nosings are usually supplied in a wide range of plain colours and white, the latter being particularly suitable in public buildings. 1, 2 or 3-line borders and nosings may be supplied in self-colour or marbled patterns.

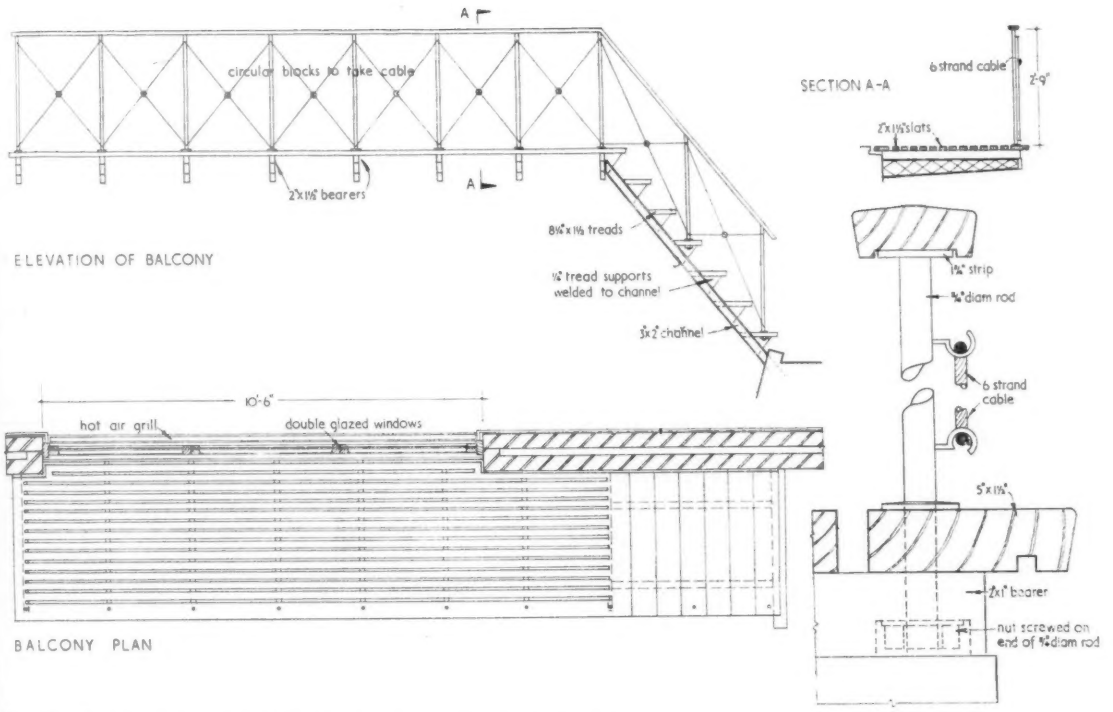
British Standard

Rubber treads, nosings and risers are formed from solid rubber which should comply with the requirements of British Standard 1711 : 1951 *Solid rubber flooring*.

Further Information

The British Rubber Development Board maintains a Technical Information Bureau which is available to answer questions and advise on technical problems dealing with this subject generally.

Compiled from information supplied by :
The British Rubber Development Board.
Address : Market Buildings, Mark Lane, London, E.C.3.
Telephone : Mansion House 9383/4.

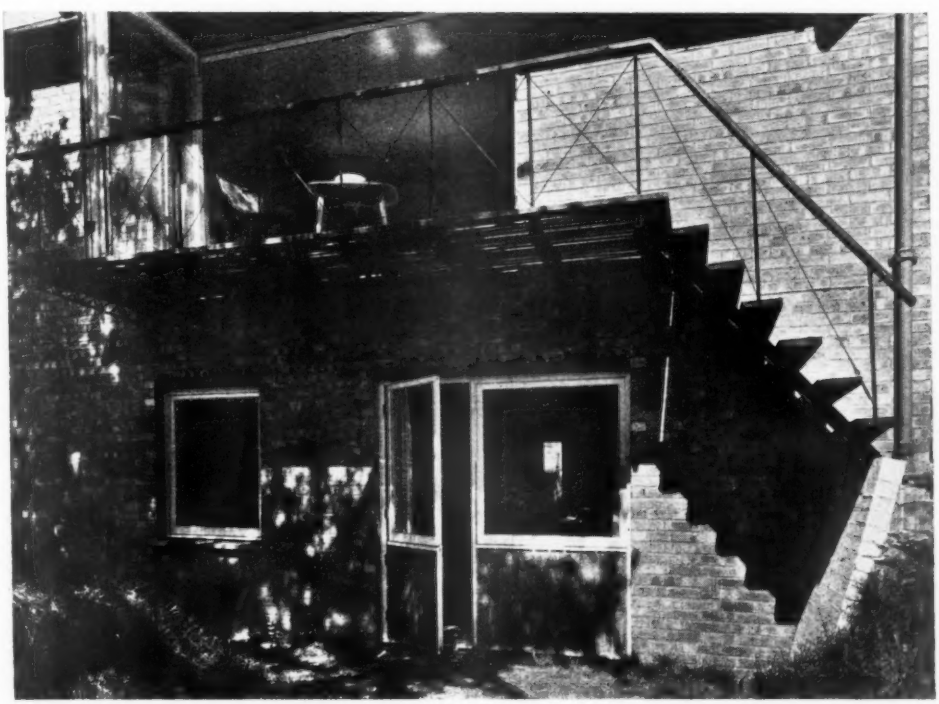


Details of first floor balcony and outside staircase [Scale : ¼" and 3" = 1' 0"]

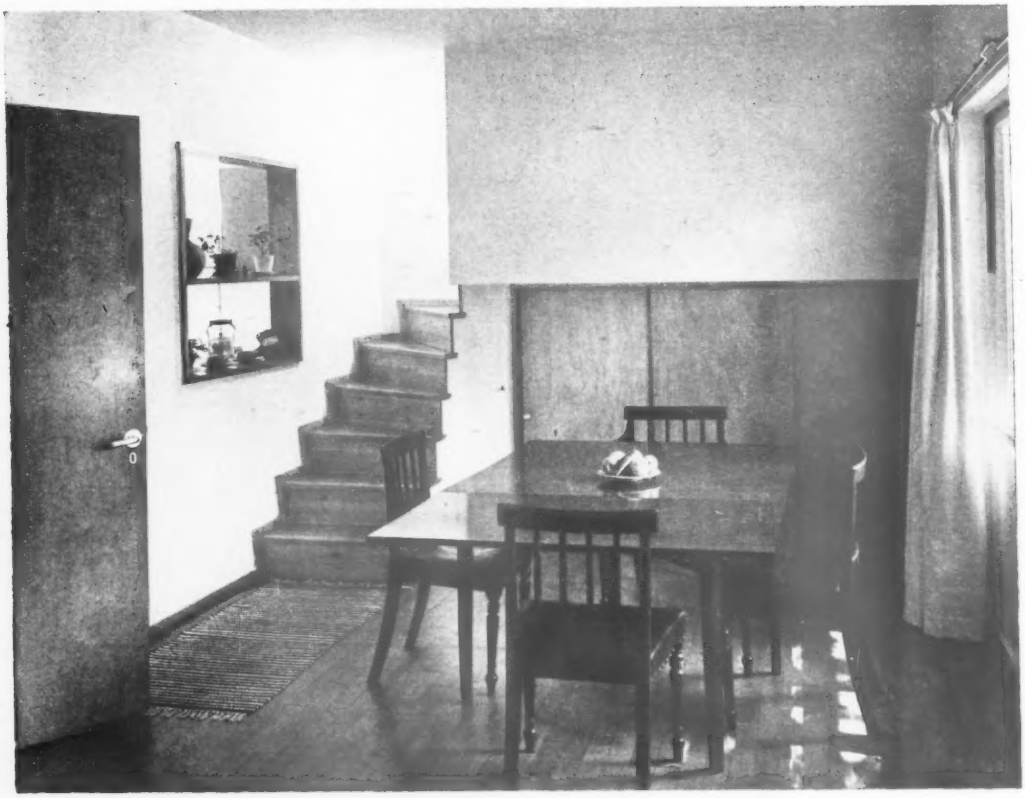
designed windows are of wood painted white and are thought to be of a maximum size compatible with the æsthetic form of the building. All walls are plastered internally and painted white. The ground floor is covered with deal blocks, the bathroom

HOUSE

in NORTH END, HAMPSTEAD HEATH, LONDON, N.W.3
designed by the ARCHITECTS' CO-OPERATIVE PARTNERSHIP



Above, living room on the left and bathroom and lobby on the right. Right, the garden door to the dining room under the first floor balcony.



Left, the ground floor dining room with the hatch to the kitchen on the left of the staircase. Below, left, the living room with the main bedroom seen through the door on the left. Below right, looking west with the garden entrance on the right.

HOUSE

in NORTH END, HAMPSTEAD HEATH, LONDON, N.W.3
designed by the ARCHITECTS' CO-OPERATIVE PARTNERSHIP

floor is of black and white vitreous tiles and elsewhere quarry tiles are used.

SERVICES.—Heating is by radiant heat effected by circulating hot air in the first-floor cavity formed by steel joists, as a closed circuit. This gives floor heating to first floor and ceiling heating to ground floor. The boiler, which burns anthracite, also heats the water. There is no flue other than for the boiler.

The general contractor were Yeomans & Partners, Ltd. For sub-contractors, see page 364.

TECHNICAL SECTION

Continuing our reports of the Building Research Congress, 1951, we publish below summaries of papers presented to Division I, Part 2, of the Congress, under the general title of "The Influence of Modern Research on Structural Design." Starting with an introductory paper by G. Wastlund, (Sweden), Professor of Structural Engineering and Bridge Building, Royal Institute of Technology, Stockholm, there followed four sections, dealing in turn with concrete, steel, timber and light alloys. These summaries, together with the comments at the end, were prepared by the JOURNAL'S *Specialist Editor No. 13 (Structural Engineering). (All illustrations are reproduced by permission of the Congress.)*

BUILDING RESEARCH CONGRESS, 1951

The Influence of Modern Research on Structural Design

GENERAL REVIEW by G. Wastlund.

RESEARCH is an exhaustive investigation having for its aim the revision of accepted conclusions in the light of newly discovered facts. As applied to a discovery or invention it is a systematic study of the separate influences on the factors in its make-up. But engineering is a science in which the distinction between research and practice is not well defined, so that every progressive engineer developing new structures contributes to research.

During the last 50 years there have been great improvements in structural design and materials; for example, in Stockholm, the weight of apartment buildings has decreased from 860 to 450 lbs. per sq. ft. due, mainly, to improved materials of higher strength. More recently, welding in bridgework has saved 20 per cent. on the weight of a similar riveted structure. In reinforced concrete the introduction of high-tensile deformed lug reinforcement has saved 44 per cent. on the weight of plain steel bars used in slabs under similar conditions. In Austria cold-worked deformed bars, of allowable stress 50,000 lb. per sq. in., are so economically advantageous as to form about 80 per cent. of steel reinforcement used. With regard to timber, the amount used for Swedish houses has fallen by about 12 per cent., largely as a result of more careful and economical design.

There are, however, a number of points in modern research which require further investigation. For a start, there is still an urgent need for deeper theoretical knowledge. Building materials, particularly steel and concrete, have improved in quality and allowable stresses have increased. Consequently, structural members can now be designed much more slenderly than hitherto. But in slender structures, the influence of eccentric loads, of defects in materials, of irregularities in shape and dimensions, and of elastic and plastic deformations are much greater than in the heavier structures of the past. An improvement in methods of calculation is therefore necessary. However, theory can be exact only in relation to the preliminary assumptions, and these are often approximated to the actual conditions. As stated above, research and practice cannot be distinctly defined and often developments and experiments have indicated the channel of research which the theorists should explore. Their findings can then be verified once again by experiment.

One field which the theorists might well explore further is that of the buckling of webs in steel plate girders within the semi-plastic or plastic region. This will involve the use of a new branch of theoretical science—"rheology"—which deals with very general relations between deformations and stresses, independently of classical theory. "Rheology" is today at much the same position as was the theory of elasticity in 1821 when the general elastic equations were formulated by Navier.

Another group of problems suitable for theoretical analysis is connected with the behaviour of structures under the action of dynamic forces. For bridges with increased spans and greater slenderness the dynamic effect of traffic and wind load has become very important. In buildings, dynamic problems are now given greater consideration on account of the new severe requirements regarding sound insulation and the elimination of vibration due to machines, traffic, etc. The effects of detonations in the air and in the earth, or impact from shells, fall into a similar field of investigation; so do the effects of earthquakes.

Experimental research, as distinct from pure theory, serves to deepen our knowledge of building materials and structures. It is necessary to study not only the various properties of building materials and the effects on them of external factors, we must also understand the reasons for these effects. This can be done both by observation and by theoretical deduction.

Recent trends in experimental research have tended to unite and relate the different natural and engineering sciences in a way which allows progress in one science to cause unexpected developments in another. As a natural consequence of this, the importance of physics and chemistry for experimental building research has increased considerably. In particular, materials research needs all the help that can be afforded by these sciences. Suitable examples for this field of research include: brittleness of steel and light alloys (particularly in connection with welding), the plastic deformation of concrete, deterioration of concrete due to freezing and thawing, and the shrinkage and inner stresses of concrete. Well-equipped laboratories are essential for the progress expected to be achieved. Expensive equipment, such as the electron microscope, X-ray diffraction apparatus for crystal analysis, and the spectrograph, are invaluable in materials research. The study of metals—clays, lime and cement—also falls within the scope of this research. Revolutionary changes in the manufacture of steel have resulted from fundamental research and, with the more recent application of physics in building science, a radical improvement in materials is to be expected in the future, which may revolutionise building construction as new materials have done many times before.

In modern research on structural engineering, new developments in measuring methods have been of vital importance. Inventions such as electric strain gauges and inductive and magnetostrictive gauges have made new investigations possible. Also, tests of models of bridges and other structures can be made more accurately than hitherto as a result of the use of new modelling materials, such as plexiglass. Structural elements can be considered in the laboratory under static and dynamic action, and short-term and long-term influences can be taken into account. Comparisons can be now made of the behaviour of existing structures by means of direct measurements.

The main materials under consideration in Division I of the Congress are steel, reinforced and prestressed concrete and wood. Steel can be used conveniently for structures which have to be erected quickly or which may be changed, moved or strengthened at a later date. It is suited to large-span structures, where dead weight is important and where the cost (compared with that of reinforced concrete) is favourable. Steel structures can on the whole, give a more slender design. Disadvantages include unsatisfactory fire resistance, the difficulty of maintaining protection against rusting, and the fact that the natural resources from which steel comes are widespread and so valuable for other purposes that they must be utilized carefully.

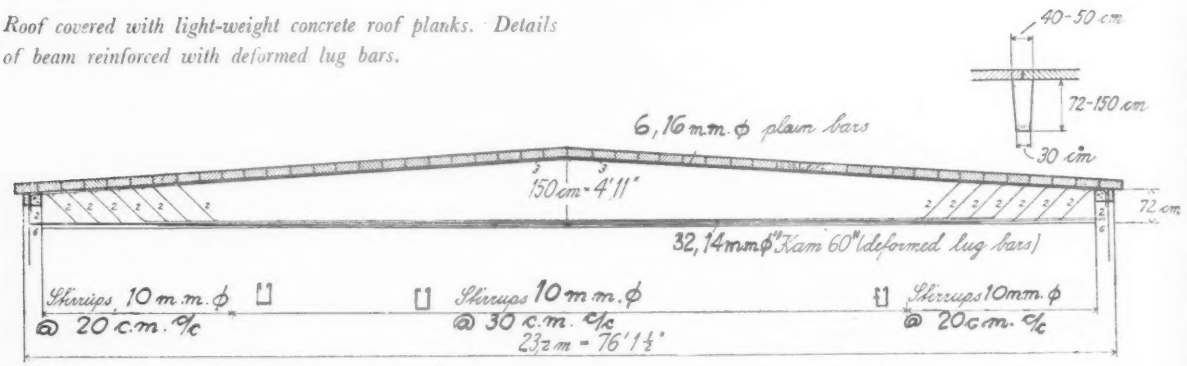
Concrete, if well made, provides an adaptable, durable material suitable for most common requirements. It is cheaper than steel and provides satisfactory fire resistance. Reinforced concrete is, in many countries, the dominant structural material, except for long spans. Its disadvantages include high dead weight, low tensile strength, swelling and shrinkage, and the necessity of using formwork for casting. The site work involved is comparatively lengthy and governs the quality of the concrete. Resistance to freezing and thawing and chemical action is far from satisfactory. Prestressing can eliminate much formwork on the site and provide better quality control. Cracking is, thereby, minimised and durability increased.

Wood is often used as a structural material, particularly in timber-producing countries, such as Sweden. It is easy to handle and provides reasonable strength in at least one direction. Its disadvantages are many: combustibility, swelling, shrinkage, creep, variability of moisture content, knots, etc. However, it can be treated against attacks by insects and animals and the effects of moist air.

For roofs reinforced concrete can be economical if the roof plate can be incorporated in the structure, as in T-beams or shell roofs. Prestressed concrete and reinforced lightweight concrete can be used effectively for prefabricated roof slabs. Lightweight slabs spanning up to 20 ft. have been manufactured in Sweden.

In general, the choice of material depends on: the type of building, supply of mate-

Roof covered with light-weight concrete roof planks. Details of beam reinforced with deformed lug bars.



rials, cost (including maintenance, insurance, etc.), strength, weight, durability, insulation properties, climate, æsthetics, supply of labour and machinery, erection methods and resistance to fire, shocks, etc. It is important that the architect, when designing a building, should consider many physical properties of the materials he proposes to use. For example, the transmission of water, vapour and heat must be carefully calculated. Take the single-storey factory building with a flat roof, so typical of industrial buildings of the last 20 years. In northern countries many defects often arise: condensation of water, decreasing thermal insulation, deterioration by freezing and thawing, water percolation, swelling, cracking of the felt roof covering, etc. Research has found answers to some of these problems, but it is necessary to design the buildings and choose materials with due regard to the humidity, thermal conditions, special requirements of the building and, of course, the climate.

Structurally we can distinguish between certain major groups of buildings, such as flat buildings, buildings with several storeys, halls without cranes, with light cranes and with heavy cranes. But the structural form will finally depend not only on the type of building, but also on foundation conditions, span lengths, lighting, pipes and ducts to be drawn and possible future extensions or changes in the use of the building. Moreover all factors influencing the choice of the materials to be used also influence the structural form.

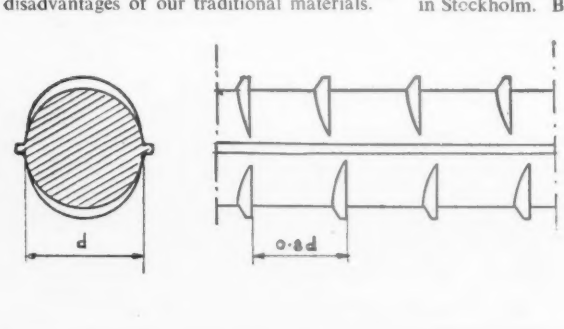
As to the future, discovery and invention will probably provide the greatest gains and new materials and erection methods may once again revolutionize building and engineering. Theory, being mathematical in character, provides a slower contribution. Aluminium alloys, while being too expensive today will probably soon be in common use for structural work. It is not yet possible to say what part will be played by synthetic materials but they will undoubtedly come into use in some way or other. New materials having better heat-insulating properties will be produced. If these could be combined with load-bearing properties they might lead to lighter, and perhaps thinner, structural elements. It is to be hoped that research will also eliminate many of the disadvantages of our traditional materials.

The four papers on reinforced and prestressed concrete were given by Hjalmar Granholm (Professor of Building Technics, Chalmers University of Technology, Gothenburg), F. G. Thomas of the BRS, Watford, A. R. Collins (technical director of the C & C A, London) and A. L. L. Baker (Professor of Concrete Technology, Imperial College, London).

CONCRETE

In the four papers which followed Professor Wastlund's introduction were considered various modern developments in research on reinforced concrete, prestressed concrete and shell construction.

H. Granholm's paper was devoted to a discussion of the merits of high-tensile indented bars. His arguments are based on Swedish practice and his own research work. The limit of the permissible stress in reinforcing steel is occasioned by the risk of cracks arising in the concrete rather than by the ability of the metallurgist to produce steel with a higher yield limit and a higher ultimate strength. This problem is concerned with the bond between concrete and its reinforcement, and great efforts have, therefore, been made to achieve a closer bond. Two methods suggested are, firstly, the use of smaller diameter rods and, secondly, the use of rods with a corrugated surface. When the latter type, under 16 mm. diam. are used, Swedish regulations allow a stress of 31,000 lb. per sq. in. and Professor Granholm's investigation suggests a possible increase to 42,000 or even 55,000. He quoted the example of a beam used in industrial property in Stockholm. Because of the use of tightly-packed, light reinforcement, cracking after six years was negligible. Further research will be carried out on the problems of using corrugations to increase bond.



Standard Swedish indented reinforcing bar.

The remainder of the paper was devoted to an explanation of the method of calculation which is based on the plastic properties of the concrete and the steel. Professor Granholm considers that the accepted theory based on Hooke's Law is unable to represent properly the conditions in a structure at or near breaking point, and that dimensioning by the breaking-load method should supersede the elastic method.

This point was carried further in the paper by F. G. Thomas, in which he considered the ultimate strength of columns, walls and beams. Formulæ were suggested for the design of axially-loaded columns and beams, but a satisfactory method for designing columns subjected to bending is not yet available. Work carried out at the Building Research Station on creep, shrinkage and cracking and their effects on structures was described. In the field of fire resistance a method has been evolved for comparing tests under laboratory conditions with the actual conditions of natural fires. It is considered that to reduce the size of columns when high-grade concrete is used would be a disadvantage, and the high proportions of steel might lead to a proportionally high loss of strength in the event of fire.

Most of the research work which has been carried out on reinforced concrete has had some bearing on prestressing, but some of the most significant discoveries are those leading to a better understanding of creep. However, much of the work on prestressed concrete will be of benefit also to users of ordinary reinforced concrete. Dr. Collins set out in great detail in his paper the various aspects of prestressed concrete research now being carried out. The work on creep, mentioned above, has been concerned primarily with concrete which we would now describe as being of only medium quality. With the development of concrete with a 28-day crushing strength of 20,000 lb. per sq. in., much new data are required. The production of such high strengths requires vibration and, despite the wealth of conflicting evidence, Dr. Collins considers that it should be possible to determine optimum conditions for various uses. A fundamental investigation appears to be necessary. More study of the behaviour of high-tensile steel at high temperatures is required and such study may prove the advisability of using alloy steels where fire risks are great. Research on the use of alloy steels and high-tensile steels in larger diameter rods also seems desirable.

In the application to structures, prestressed concrete may be used in flat slab construction, though trouble may arise in bending of the outer columns. A similar problem arises in obtaining continuity in prestressed frame construction. Road slabs have already been designed with combined longitudinal and transverse prestressing, with the idea of

increasing load carrying capacity, but the saving in slab thickness may not compensate for the cost of the complicated arrangements required for two-way stressing. An alternative is longitudinal prestressing, which can be applied at low cost. It is employed mainly to reduce the need for joints.

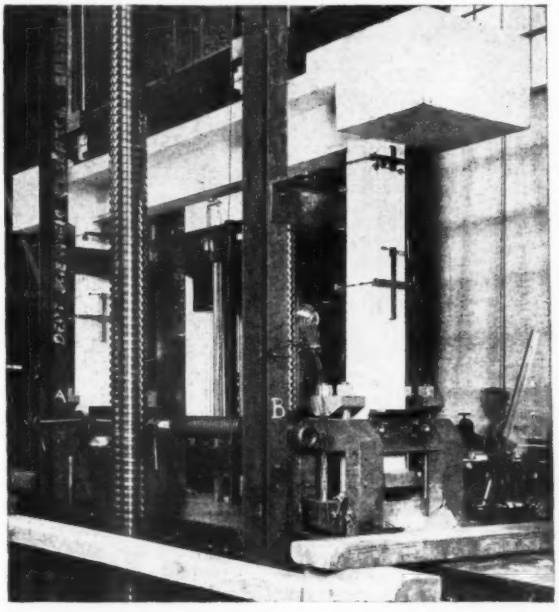
In his paper on shell construction A. L. L. Baker considered problems affecting the design of part-cylindrical shells. Jenkins's elastic theory gives accurate results under working load conditions when the shell is not cracked and there is no plasticity or tendency to buckle. But rupture theories appear to give more accurate values of ultimate strength, despite approximations with regard to stress distributions, because they take into account the effect on stress distribution of cracking, buckling and ultimate strains of steel and concrete. It is hoped that trial designs and tests will indicate the suitability of the various design methods for many types of shell, both for working and ultimate loads. The author described a method of force net analysis, which helps in determining fairly quickly the best shape for the shell and which gives approximate analytical results, neglecting the effects of longitudinal slab bending and torsion. He suggested that experience may prove that this type of analysis is satisfactory for design purposes. Experiments at Imperial College were described and show close agreement with the theories of Jenkins and Schorer.

The three papers on structural steelwork design were given by George Winter (Head of the Dept. of Structural Engineering, Cornell University, USA), F. A. Partridge, of a famous British firm of engineers, and J. F. Baker (Head of the Dept. of Engineering, Cambridge University. The fourth paper in this section, on the application of welding to steel structures, was by F. Campus (Professor at the University of Liege, Belgium).

STEELWORK AND WELDING

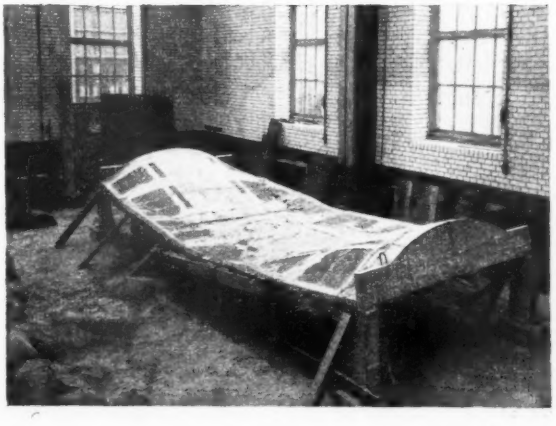
In the first of the four papers on research in structural steelwork, G. Winter discussed three separate topics: new tendencies in the established field of traditional steel structures fabricated from standard, hot-rolled members; new uses of steel in forms other than hot-rolled shapes; and general tendencies in structural design. Hot-rolled members can be the basis of floor, roof and wall supports but they cannot be used economically for the actual floor, roof or wall. In the past, these have usually been constructed of other materials. However, corrugated steel for roof and wall sheeting has been in use for some time and, recently, steel roof decking has come into standard use. Professor Winter has been in charge of research at Cornell University since 1939 and efforts made there have culminated in the adoption of a Code of Practice for Light Gauge Steel Standard Members, so that, with both the practical and the legal aspects removed, the use of light-gauge steel for structural purposes has become widespread. It is used for structural elements of conventional shape (Fig. 1) and also in the form of load-carrying panels for floors, roofs and walls (Fig. 2). Light-gauge floors have been used in heavy frame structures of 30 or more storeys, resulting in reduced deadweight, quicker construction and increased space for services. A similar development is taking place in the use of light-gauge structural sections for wall and floor framing, roof trusses, etc., but this has been retarded by the shortage of sheet steel.

With regard to general tendencies in steel design, Professor Winter's paper overlapped both that of F. A. Partridge and that of Professor J. F. Baker. The latter has been intimately concerned in investigating the behaviour of steel-framed buildings since 1929, in an attempt to derive rational and, therefore, more economical methods of design. The study of the frames of actual buildings in course of construction, together with comprehensive laboratory investiga-



Test on a portal frame in a study of redistribution of moments. Considerable increase of load was carried after incipient failure of the column-head section. The horizontal reactions at the foot of the columns was measured with helical springs, which were adjusted to give zero spread of the feet. (Crown Copyright Reserved.)

¾-in. thick prestressed shell under test at Imperial College.



Reinforced concrete shell at Imperial College after collapse due to longitudinal compression accompanied by buckling.

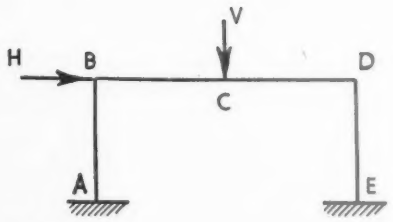


Fig. 3.

tions of beam to stanchion connections, led to the production in 1936 of certain "Recommendations for Design." But this design method, based on elastic behaviour, was not acceptable to the industry because of its relative complexity. The increased reliability of welding now makes possible rigidly jointed frames and attention has, therefore, turned to steel structures in the plastic range, and it is hoped that a simple method of design will be evolved as a result of the consideration now being given to the condition of structures at the point of collapse. While it cannot yet be claimed that the behaviour of structures within the plastic range is understood thoroughly, the boundary of knowledge has been advanced sufficiently to indicate that these hopes are justified.

The collapse loads of portal frames in which axial loads are small can be calculated readily by the method. Thus, a fixed-base frame as shown in Fig. 3, loaded vertically at the centre and horizontally at beam level, will fail according to one of the "modes" shown in Fig. 4. The mode of collapse in any particular case depends on the ratios of the loads and the full plastic moments of the beam and stanchions. Small-scale tests and full-scale frames have confirmed that these assumed modes of collapse are correct. The full-scale work indicated, however, that certain factors, such as strain hardening, limiting deflections and lateral instability of the members, which had little effect on these particular tests, might assume much greater

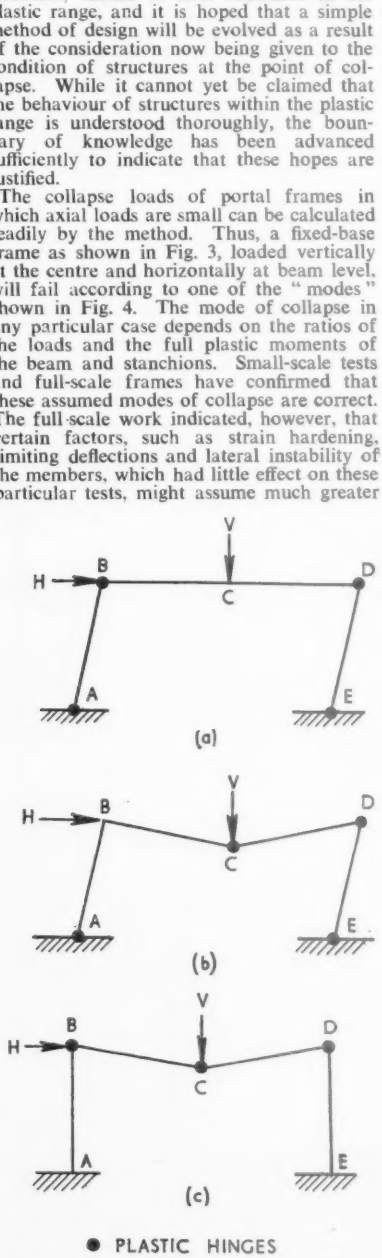
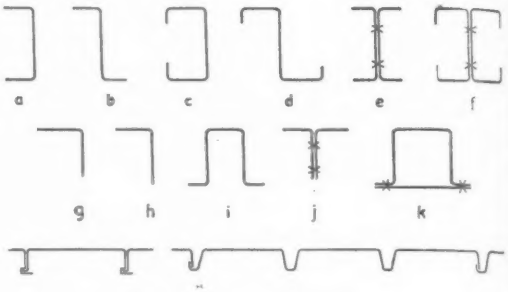
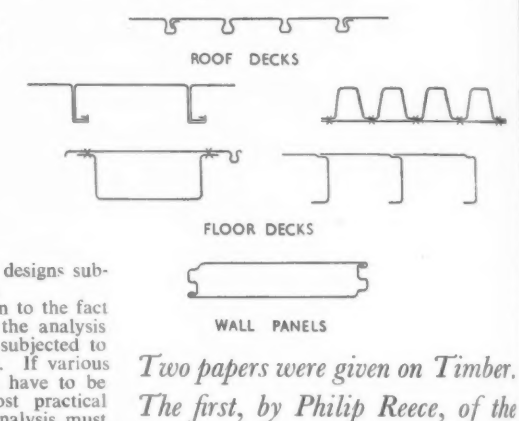


Fig. 4.

Right, Fig. 1. Light-gauge steel structural sections.



Right, Fig. 2. Light-gauge steel decks and panels.



importance for frames of other designs subjected to other load conditions.

Professor Winter drew attention to the fact that the extreme simplicity of the analysis applies only if the structure is subjected to one single pattern of loading. If various types and character of loading have to be considered, as is usual in most practical structures, a complete elastic analysis must be carried out, in addition to the plastic analysis; also, the plastic analysis is realistic only if the structure is capable of developing complete plastic hinges, and if these hinges are, in turn, capable of undergoing considerable plastic rotation without the occurrence either of local buckling or of brittle fracture. Whether this finding can be generalized to include all continuous steel structures remains to be proved. Nevertheless, it is certain that the theory has not only enhanced our basic understanding of structural action, but that its influence on practical design is already making itself felt. For example, the USA basic design code now allows an increase of 20 per cent. in allowable stress at interior supports of continuous beams and in extreme fibres of columns subjected to combined bending and direct stresses.

The final paper in the steel section was by F. Campus of Belgium, who dealt with research into the welding of steel structures. The use of welding in steel structures is of fairly recent origin—a matter of some twenty years—and research is in its early stages; certainly, its final goal of a widely-accepted code of practice has yet to be achieved. The contractors' objections to welding are obvious—its more extensive use would render obsolete the plant and workshops used for the fabrication of riveted and bolted work, which represents large amounts of invested capital. Hence finance is not forthcoming for the extension of this research.

However, research concerning welding itself is very well advanced. Gas welding and electric arc welding are in brisk competition, the latter being more appropriate for steel structures, while the use of spot welding may be suitable for the fabrication of light-gauge, cold-formed steel members. The quality of weld metal now obtainable may be considered suitable for all purposes. Both static and dynamic strengths of single welds are well known and, provided the welds are sound and free from important defects, are perfectly reliable.

Stresses due to welding can also be predicted (with some approximation in cases of restraint) and often reach the elastic limit. With reliable data regarding shrinkage and thermal expansion, it is possible to make good use of the prestress due to welding.

Two papers were given on Timber. The first, by Philip Reece, of the TDA, London, on structural uses of timber in the UK; the second, by Carson Morrison, associate Professor of Civil Engineering, University of Toronto, Canada, on glued laminated timber.

TIMBER

P. O. Reece reviewed the structural use of timber in the United Kingdom. It is evident that, between 1939 and the present day, timber has changed from being a relatively cheap and plentiful material, occupying a position of primary importance in British economy, to one which is relatively costly and scarce. There are three aspects of timber economy: complete elimination, reduction in use, and balanced consumption. In the first case, substitute materials must be found; in the second, design must be improved and sizes, safety margins and waste reduced; in the third, the use of home-grown timber saves imported timber and the used of hardwood and plywood saves softwood. Sizes and margins have now been reduced to a point consistent with safety and it appears that little further progress can be made in the reduction of waste. Curtailment of home felling has restricted the substitution of home-grown for imported timber and the increasing importance of the cost factor has hampered the substitution of sterling hardwoods for softwoods.

It is considered that, at the present time, the most profitable field for research lies in improving the design of softwood structures, in the development of uses for hardwoods in which their higher cost is justified, and in the development of structural uses for plywood, as increasing supplies permit. The outstanding virtue of timber as a structural material is its stiffness per unit weight and its cost. The most promising

field for engineering research lies, therefore, in the direction of structures or components which are liable to fail through elastic instability or bending rather than through direct tension, compression or shear. This points to structures or components which are large in relation to the loads they have to carry: single storey buildings of all kinds, especially those of large height and span; roofs of all kinds; floors of moderate or low loading; footbridges; towers; pylons; etc.

An important development is the codification of working stresses and design procedure. A classification of structural softwoods with basic stresses, which has been accepted by the Timber Code Committee, is given in Table I.

Timber is weak in shear and the development of efficient shear-resistant joints is a great advance in timber engineering. The jointing materials in order of structural efficiency are: adhesives, timber connectors, bolts, nails and screws. Since the war, attention has been given to the connector, as gluing is essentially a prefabrication technique and prefabrication has almost been ruled out by the scarcity of timber.

The general purpose of research is to determine the class and form of structure to which a material is inherently suited and to codify design procedure. Various aspects of the latter which require investigation are: strength properties of commercial timbers, methods of jointing, the application of structural theory to an anisotropic material and preservation.

Glued laminated timber was described in a paper by C. F. Morrison of Canada. The use of laminated timber is comparatively recent and, by shop processes, there can be produced a timber unit larger and stronger than can be found in its natural state. It is not a substitute or inferior material but has, in fact, replaced structural steelwork to a considerable degree, even when steel is in good supply. When used for straight members, such as columns and beams, laminated timber can be considered a substitute for sawn solid members, but its more usual and more effective uses are as curved rafters, truss chords and arches of various shapes. Because of the thinness

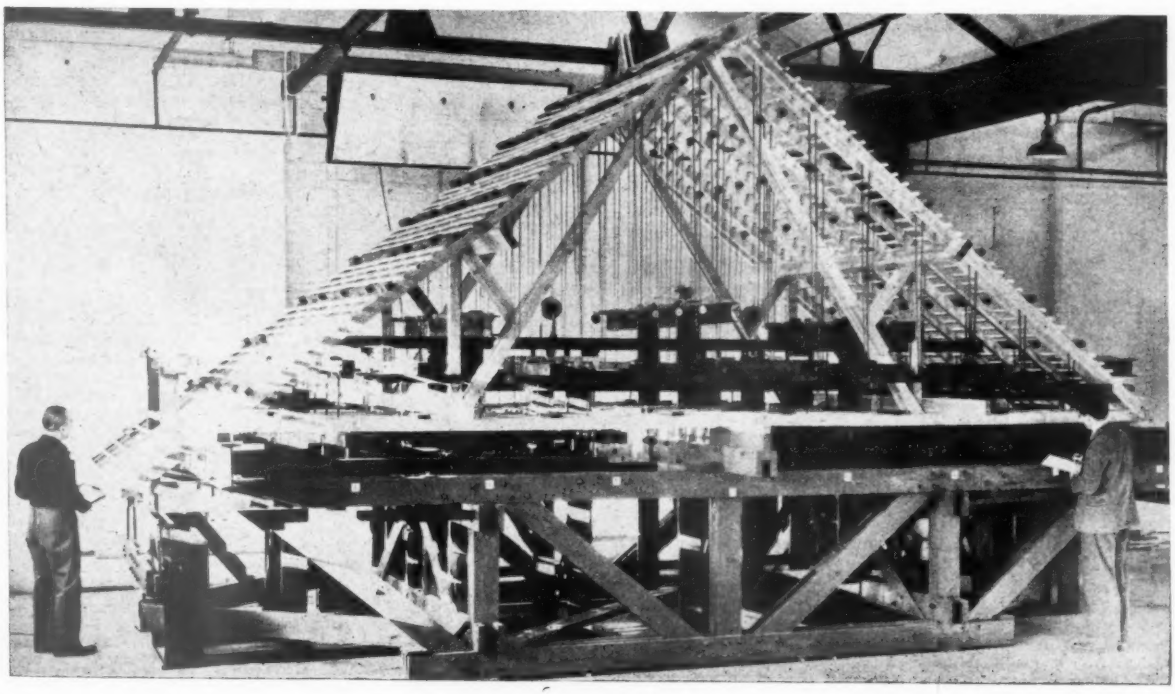
Right, section of 3-hinged arch using ¾-in. laminations of southern yellow pine. Note arch form and clamping device.

Bottom, a laboratory test on 12-ft. length of standard house roof of 21 ft. 6 in. span. Load is distributed through steel tapes from link system.

TABLE I

Class	Standard Name	Flexure and compression parallel to grain	Tension	Modulus of Elasticity		Shear parallel to grain	Compression perpendicular to grain
				Mean	Min.		
		All values are in lb./sq. in.					
A	Douglas fir (coast) Longleaf pitch pine Shortleaf pitch pine	1,000	1,500	1 600.000	1,000,000	100	350
B	Canadian spruce European larch Redwood Whitewood Western hemlock	800	1,200	1,200,000	750,000	100	250

Mean value of Modulus may be used for rafters and floor joists.
Min. value is appropriate to principals, binders, or other components acting alone



of the laminations, it is possible to dry the material in much less time than would be required for large structural members. But a disadvantage is that the total cost of a member, including cost of the timber, drying and surfacing the laminations, glue, its application, assembly, application of pressure and curing, is high.

Only one paper was presented to the Congress on the subject of light alloys. This was by A. G. Pugsley, Professor of Civil Engineering at the University of Bristol. The discussion on this paper brought to a close Division I of the Congress.

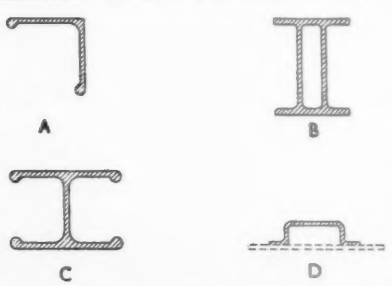
RESEARCH ON THE DESIGN OF LIGHT ALLOY STRUCTURES

Professor Pugsley's paper was devoted mainly to a consideration of the stability of structural sections. Research at Bristol and Newcastle has covered torsional properties of sections, lateral stability of beams, and torsional and local stability of struts. Investigation of torsional properties at Bristol has indicated that practical limits to the use of light alloy sections in torsion are likely to arise either by the onset of permanent twist as the proof torque is reached, or by the occurrence of excessive elastic twists. A proof torque should be adopted corresponding, perhaps, to a permanent twist of 0·001 radians per inch length.

The modulus of elasticity of light alloys, being approximately one third that of steel, indicates an increased liability to lateral instability. Experiments suggest that, where joists or floor slabs sit directly on the section in question, a surprising resistance against lateral instability is provided.

In the case of torsional stability in struts, research has indicated which sections are most liable to instability and it is hoped that the theory will be developed to provide some simple method of design. Local stability investigations have already contributed to fundamental knowledge of buckling. Alternative remedies are to make thicker some of the present standard sections or to stabilize outstanding flanges and thin webs by beads, lips or longitudinal corrugations, as shown in the diagram below.

Jointing of light alloys may be by aluminium or steel rivets, welding or adhesive materials. Research on all kinds is in progress in this country and has so far indicated that the conventional theory for steel rivet design may need some extension or reorientation for aluminium work. Although using an inert gas to envelop the welding area has given some success, little use has yet been made of welding. Special adhesives have been used successfully in aircraft work, but they require to be set under pressure and at a controlled temperature.



Some special light alloy sections suggested by Temple. A, angle section strut. B, beam with high torsional stiffness C, I-section strut. D, plate stiffener.

Local instability of a thin light alloy channel section.

The following comments on the papers summarised above are, like the summaries, by the JOURNAL'S *Specialist Editor No. 13 (Structural Engineering).*

The papers in Division I Part II give a fairly comprehensive picture of the scope of present research as applied to concrete, steel, timber and light alloys. Despite Professor Wastlund's attempt to define research in engineering, it appears rather difficult to distinguish between developments which have arisen from practice and those resulting from research. In the end, however, the interest of the architect or builder is directed to the development itself and its effect on æsthetics, the economy of materials and labour and the cost of building.

The authors of the papers all seemed to agree that the aim of research should be to investigate more fully the nature of the materials under consideration. The plastic theory of design was advocated both for steel and concrete, and will show an economy in material. The properties of steel were well defined and it seems reasonable to suggest that the main efforts in plastic design should be directed towards structural steel. A laboratory for the British Welding Research Association has been constructed as a series of single-storey, four-member frames, designed on the plastic theory and the frames show a saving of 17 per cent. in weight over frames designed on the classical method. For such frames the design procedure is straightforward but the full value of this theory will not be felt until its scope has been extended to more complicated framed structures, without undue complication of the design method. Far more knowledge of the physical properties of concrete is required, however, before the plastic theory can achieve similar results in reinforced concrete and, for full economy, a much tighter control will be required of the quality of site concrete—a none too easy task in building work.

The only reference to reinforcing steel was to the use of the deformed high tensile rod. The claims that there is less liability to cracking, in view of the smaller diameter of the bar, and that higher allowable bond stress can be used are sound, and there is a saving in weight of steel of about 40 per cent. On the other hand, the cost of the steel in the work is 25-30 per cent. higher and the actual saving in total cost is very small.

In the field of prestressed concrete the scope for research is enormous and, with greater knowledge of creep in concrete and steel, bond, shrinkage and anchorage losses, we may expect more economy in material. With the development of higher strength concretes, the design of slender structures of much larger spans will be possible. Under our present hostages, prestressed concrete saves both concrete and steel. The use of longitudinal prestressing for roads can cut out expensive joints and maintenance at joints.

It was surprising to find only one slight reference to prestressed structural steel members. Professor Magnel has done considerable work on this subject and it was dealt with at some length by Professor Soete of Belgium in a paper to the 1951 International Welding Congress.

The development of light-gauge steel members in the USA is interesting but is of little help to the present building problems in this country. When more sheet steel is available, its use for floors and wall panels may lead to a reduction in dead weight.

Aluminium is still in its infancy as a structural building material and, at present, its high price prevents serious competition with steel on the initial building costs. It is best used under such conditions of low live to dead load ratios as in the new hangar for BEA at London Airport.

The introductory paper to Division 2 of the Congress—the division dealing with Building Materials—was given by Dr. T. W. Parker, Deputy Director of Building Research at the Building Research Station, Watford. This important paper, which was entitled "General Trends in Research on Building Materials", is reprinted below in full. In it, Dr. Parker emphasized that materials research should include the study of fundamental problems as well as day-to-day work.

DIVISION 2 : BUILDING MATERIALS

INTRODUCTION by Dr. T. W. Parker (Great Britain)

The division of this Congress which deals with research on building materials has to survey a wide range of subjects on which a considerable amount of work has been done. Even though it is recognized that building research has come late into the field of the applied sciences, the study of building materials has reached a stage of detailed investigations such that it would be impracticable to touch on all the items which have been pursued. Certain of them have, therefore, been selected for discussion in this division, while others have had to be omitted. In dealing thus with detailed studies, however, it is important neither to overlook the broad trends which have led to the studies taking their present form, nor to omit to consider the most fruitful broad lines of direction for the future. A unanimity of viewpoint is unlikely on either of these; it would indeed be almost evidence of stagnation of thought if it were so. The present paper, therefore, while presenting some views by one author, is intended mainly as a basis for discussion of the subject.

OBJECTIVES OF RESEARCH

Nearly all forms of research on building materials can be traced either directly or indirectly to questions of performance in use, and until recently have dealt in effect with the cure or avoidance of failure in three specific directions: stability, durability, and weather resistance. The term weather resistance is used to mean the ability of an assemblage of materials to exclude wind and rain; the alternative meaning of ability to withstand the weather without disintegrating is, of course, included in the term durability. Questions of stability and the strength of materials are traditionally associated with engineering studies, although the more fundamental properties of materials which impart cohesion and strength remain within the purview of those studying building materials. There remain then the major subjects of durability and weather resistance, and more or less automatically there must follow a pattern of investigation. The first part must deal with the identification of the natural or man-made influences which affect durability; the second, the properties of materials which are affected by these influences; and the third, the properties which produce good or bad weather resistance. On the first, most attention has naturally been paid to the action of atmospheric conditions, while a peculiarity about the second is that it has necessitated the intensive separate study of individual materials. Until recently, it has not been particularly fruitful to study materials classified, say, into materials for roofing or for walls, or into any other classification. The reason is probably that the actual materials available to the builder are so diverse in type, both physically and chemically, that a considerable degree of specialising is required. The diversity is such that the differences in importance that one or other of the factors in natural weathering possess in relation to the different materials has a greater bearing on the applied science of building than whether the materials are to be used in one or other positions on the outside face of a building.

The properties of a material which bear on its ability to protect the interior of the building against the weather, and particularly against rain penetration, are not necessarily the same as those which affect durability. They are, however, linked. An attempted improvement in the one might indirectly result in a change for better or worse in the other. Experience has shown that although we may start with the general idea of investigating durability and weather resistance the investigations turn to detailed studies of the properties of the individual materials themselves as soon as sufficient knowledge of the problems makes these studies possible. The advantage lies in the resulting greater ability to forecast behaviour under a wider range of conditions or alternatively to forecast the effect of modifications in the structure of the materials. A practical advantage of real importance lies also in the greater possibility of reducing the time needed before forecasts of behaviour can be given, as compared with the time required when an opinion is based on systematic observations on exposure sites.

It cannot yet be said that research into these detailed fundamental properties has progressed very far, although considerable advances have been made in some directions. The ultimate reliance on trial exposures even in advanced cases indicates a lack of confidence at the present time in the deductions drawn from fundamental studies; this lack of confidence can only arise from realisation of insufficiency of knowledge bearing on the problems.

With the background knowledge from the study of the materials which has already been gained, it is fair to consider two questions. These are dealt with in turn below:—

(*a*) To what extent has it been possible to systematize the examination of materials for durability and weather resistance? This question can be set in simpler form by means of a direct example. Given a new material of unknown composition, is it possible to operate an accepted schedule of tests that will give results leading to a reliable forecast of probable durability? The short and obvious answer is that there is no such schedule. Nevertheless, it is not necessary to investigate every new material afresh. Previous experience does help to shorten the amount of investigation necessary. It is suggested that sooner or later it will be a useful step to compare the lines of importance which have been found for the different materials and to attempt to bring together common factors or common methods of attack, for all climates. At the present time, the kind of information obtained in one country is seldom easily applied in another. For example, the kind of information secured for a material to be used in the United Kingdom often shows gaps if applied to use in the tropics. Yet with a slight extension of investigation it ought to be easily possible to produce data and conclusions which could be more widely applied. This point extends beyond the discussion of durability to many other functional requirements. Either for helping international trade in building materials or for a more rapid interchange of new techniques of building, some agreed means of providing the right kind of technical data would be an obvious benefit. In its widest sense this question is not simply one of international standardization although it is true that the latter would form some part of it. The author has not attempted in the present paper to formulate any definite suggestions; a number of the papers before the division are relevant to it and to anticipate them in this way would lead to repetition.

(*b*) the second question is whether the emphasis on durability and rain resistance as the most important items in investigating building materials should persist at the present time or whether the concentration of effort could most profitably be turned elsewhere.

It will not be disputed that the two problems are important, at least in Great Britain. When damp penetration occurs in a building it is always a source of trouble and expense to the occupants or owners, and if an order of priority had to be given on functional requirements it is probable that the provision of a dry interior would be placed next in importance after stability. On the other hand, the outlook on the need for durability has undoubtedly changed with changing social and economic circumstances. In Great Britain the emphasis is much less on extreme durability, because fewer buildings of the monumental type are being built. On the other hand there is still a demand for adequate durability over the periods for which a building will probably be useful. The investigation of durability produces a good deal of data on the nature of maintenance requirements. The fact that considerable or frequent maintenance costs may be forecast is a deterrent to using less durable materials. But more exact knowledge on probable maintenance requirements does produce a condition in which the architect or builder can balance the possibility of using perhaps a more expensive starting material against that of using a less expensive and less durable material if it is known that the latter can be maintained by periodic but inexpensive treatment.

It is the author's view that, even in the changing social and economic circumstances of today, the investigation of durability remains of importance, but that other aspects have also become important at the present time.

THE EXTENSION OF OBJECTIVES

The trend of research on building materials must obviously take cognizance of the trends of research and of current problems in allied fields, particularly in other branches of building research and in building in general. In the latter, prominent items, not necessarily in order of importance, include the following:—

(*a*) the identification of functional requirements of buildings.

(*b*) The current problem of reduction in cost of building.
(*c*) The current problem of increasing speed of erection.
(*d*) The current problem of the use of substitutes.
(*e*) The most effective use of national resources of building materials.

IDENTIFICATION OF FUNCTIONAL REQUIREMENTS

The original direction of research towards the functional requirements of stability, durability and weather resistance has already been noted. Freedom from excessive fire hazards might have been added to these, since conscious steps to minimize the risk of conflagrations in towns have been taken at least since the Great Fire of London in the 17th century. Although the nature of the materials themselves have an obvious bearing on fire behaviour, it is the behaviour of the structure as a whole, or at least the behaviour of major elements (party walls, floors, roofs and so on) which is of most importance. In this sense, although it falls outside the main scope of building material research, it has nevertheless to be borne in mind as a limiting feature in the development of materials which at times has produced special materials research features on its own account. Examples include studies on the improvement of the fire behaviour of concrete through the use of aggregates differing from the normal and the development of lightweight protections to steel of the gypsum-vermiculite type, while a considerable field of research developed during the war on modifications to materials or of surface finishes to them designed to minimize surface spread of flame. All of these are included in what may properly be designated as research on materials although they are only a preliminary to research on the functional requirements of the structure.

In the same way, the more quantitative treatments of other functional requirements of buildings, such as thermal and sound insulation, either weight the choice of worthwhile developments in research or lead to special directions of research aimed at producing properties which will ease the fulfilling of one or other requirement. The advantage of a way of research which investigates each type of material separately is that it can, on the whole, readily absorb these additional demands by some expansion of the existing studies. Advances in other fields of building research always affect building materials usage in varying degree; the direct practical application of these advances often makes new demands affecting the suitability of materials. Ideally it is desirable that progress on the materials side should always be a step in advance so that it is possible to meet the demands when they arise. Clearly the only way this can be done is to extend research on any given material to the limit of knowledge of its structure and properties even in directions which cannot be seen to be immediately useful. Examples of the value of this are not lacking, particularly in the field of the chemistry of cements, but there are limits to the available resources both of investigators and money, and such forms of research have to compete with the demands for data to meet urgent day-to-day problems. It is fortunate that the need to preserve a proportion of longer range fundamental research seems to be widely accepted in the field of building research in general and building materials in particular. There is scope for much more as circumstances permit, for only in some isolated directions are the boundaries of the more fundamental investigations much in advance either of practice or of the more directly applied research.

THE PROBLEM OF REDUCTION IN COSTS

The high cost of building is probably the most serious problem facing the building industry today. The relative proportion of cost due to materials and to labour differs in different countries, but the cost of materials is never negligible and is often the greater part. The problem is so urgent and widespread that it might be expected that a high concentration of effort of research would have reduction in costs as its objective. At first sight, it does not appear that there is this concentration of effort, because the modes of attack are not always obviously related to this objective. The problem has, in fact, considerable complications and it is worth while to examine the position in more detail.

In the first place, the major building materials are mostly either natural products or products removed from the natural by only one or two stages of simple processing and are already very cheap if compared either by unit volume or unit weight with materials used in other industries. The expense lies less in the cost per unit than in the number of units required for even the smallest building. The general direction of research on materials has been towards improved quality of performance, because of a user-need for something better than existed. But the scope for improvement without introducing additions to the manufacturing processes is limited in many cases, so that the search for improvement in quality would often tend to increase rather than to decrease the first cost of materials. This subject is considered in a separate section below.

In the second place, there is the possibility of reducing the amount of material required for any given building. This can be considered both in terms of planning of occupancy space and also by refinements in structural design. The latter is closely linked with performance of materials. For example, much possible refinement is lost if the variability of a product is high. On the other hand, to improve quality by a reduction in variability may increase the cost of the materials. The balance between these two is an important problem which is recognized in papers given later on some specific examples.

Apart from these, the influence of the cost question on building materials research is shown by a shift of concentration on to those materials which are least expensive, often in the direction of trying to improve them sufficiently but at minimum cost, so that they become capable of being used in positions requiring fairly high quality. For example, it may be possible to raise the quality of a material, previously used only in interiors, so that it can be used on external elements, as has been done in the United Kingdom with clinker blocks. Another direction is in investigating the possibilities of inexpensive by-products or waste products from other industries. Furnace clinker as used in clinker blocks is one example, blast-furnace slag is a second; both have been used successfully. Other examples are pulverized fuel ash, sawdust, slate waste, and so on.

It is necessary also to consider how a reduction in the standard of quality needed to meet accepted functional requirements would achieve the desired results. However, it is not difficult to show that the results might be much below what was desired. It has already been noted that economies in structural design may require a higher quality, at least in degree of variability. A reduction in quality would have the converse effect from the structural point of view and would probably mean that more material would be required. A lower standard of durability might mean no more than higher maintenance costs, but it might mean a performance capable of being maintained only with the greatest difficulty. A lowering in quality in the sense of reduced thermal insulation would tend to defeat its own ends in affecting fuel economy adversely, and so on. The case for maintaining a standard of good quality in building materials and in the combination of materials making a structure is a strong one. If the building industry had strong technical staffing, it would be possible to suggest one or two ways in which a reduction in standards could be attempted, using additional technical devices to avoid the extra elements of risk incurred, but a general lowering would seem inadvisable.

INCREASED SPEED OF ERECTION

The speeding up of building operations after the 1914-18 war produced problems and troubles in the finished building; the need to solve these was one of the factors in the United Kingdom which led to the founding of a Building Research Station. The speed-up in this case was attempted while very largely retaining the use of traditional materials.

When the attempt to reduce the number of man-hours for a given building is made by means of non-traditional methods, as at the present time, problems are presented at once in the building material field. The relative importance of the different materials is altered and, within any one material type, the relative importance of different properties is also altered. For example, a move towards "dry" construction brings into prominence the extended use of sheet materials and of jointing mastics, and emphasizes the need for certain properties in these which they may not have had before. Experience in this country does also suggest that it increases the need for close linking of all branches of building research, especially in those cases where the absence of traditional experience means that the ultimate performance has to be deduced solely from a scientific or technical analysis. An example may illustrate this point. In the United Kingdom, traditional building has not made much use of impermeable outer claddings, except to a certain degree on roofs. There is also a discernible difference between the broad design of roofs and walls. Roofs make use of a series of materials each performing one function—an outer layer as the weather-resisting skin, a second insulating layer, and a third for structural support. The wall materials, on the other hand, frequently have multiple functions—weather resisting, structural and insulating. If we now consider a non-traditional construction in which the outer layer is impermeable in both walls and roof, *e.g.*, metal sheeting, and in which walls and roofs both contain single-purpose materials, we have to try to foresee at what possible points problems may occur. Some will be obvious; the durability of the metal and the greater difficulty of avoiding rain penetration at joints are examples. Others are less obvious purely from the building material point of view. They do not become obvious until the whole structure is considered, together with factors such as the heating and ventilation, the appliances to be used by the occupants, and so on. When this is done, a problem such as that of avoidance of condensation in the interior may become considerable and only soluble by joint investigation.

A great deal of time has had to be spent during and since the war on the development of materials or on the transfer or adaptation of materials to serve functions caused by the absence or scarity of the accepted materials. The accepted materials may have become scarce because of the inability to match an increased volume of building by an increased production, but frequently the cause of scarcity has been outside the normal field of building altogether. Especially in the last case there is little opportunity to foresee the scarcity and to carry out the necessary research in advance. The result is that when investigation comes to be made, there is an unavoidable waste, since the

urgency for quick results is increased. Further, the lack of knowledge whether the scarcity will be prolonged or whether it may be relieved at short notice tends to lead to the adoption of temporary expedients rather than to the discovery of alternative materials of permanent value. Where it has been accepted that a shortage is likely to continue, the converse has happened; the incentive to develop alternative materials has produced those of permanent value. A notable example of this is in the alternatives to softwood boards found for floor surfacing.

The problem of alternatives is quite closely linked with the problems which have emanated from non-traditional building. Solutions have often involved changes in design outlook to make use of other known materials in ways different from normal; problems of identification of desirable properties, which have lain dormant while some accepted procedure was giving trouble-free results, have become live and the solutions in either case have advanced the general science of building.

THE EFFECTIVE USE OF NATIONAL RESOURCES

Amongst the early problems of building research were those which were caused by the introduction of materials into regions where they were unfamiliar to the traditional crafts. It is usually considered that this occurred partly through increasing facilities for transport and the greater use of mass-production methods of manufacture. There is, however, a limit to this movement of low-cost materials. Most industrial countries do depend to a large extent on the production of most of their own major building materials. From this point of view, an aspect affecting research on materials may emerge. The general aim of high quality may need modification to an aim of adequate quality. Again illustrating this with an example, it is possible to specify the desirable properties of building and concreting sands. The highest quality may be limited to a few natural deposits. If there is too much insistence on the highest quality product in all circumstances, it may lead to exhaustion of supplies. A lower grade would often be adequate and more economical of the resources available. On the other hand, there may be no sources of the most desirable material, but only supplies of material which would give less than perfect results if used normally, and this calls for a form of research to show in what way (whether by design, or by altered craft processes, or by modified manufacturing process) these difficulties can be overcome.

RESEARCH ON MANUFACTURE OF MATERIALS

All the types of research described above can be applied for the benefit of materials manufacture in the sense that they tend to identify the properties to be aimed at in the finished product. They can also be used in manufacturing research designed to cheapen the product by providing check points at which it becomes risky to alter properties too far.

The benefits which might be realized by a decrease in the variability of building materials has already been mentioned and is directly or indirectly the subject of other papers. While the basis on which progress in this direction can be realized must start with laboratory work, it also requires pilot plant work as well. Such work can be very expensive on its own account, and if we accept that its main justification must be reduction in costs of the finished building, it is insufficient merely to carry it out as technical research; cost analysis aimed at relating the work continuously to the cost of finished building is desirable. In the United Kingdom there has been a number of examples of the extension of this form of research on building materials within recent years. Experience at the Building Research Station has shown that, as might be expected, there is a difference in the nature of the results aimed at, depending on the background science of the investigator in charge. Building material research has to some extent become the province of the chemist or the practitioner of related sciences. In the case of pilot plant work, the natural trend is then to examine the process in comparison with the usually more highly controlled laboratory process and to check either that the stages of the process produce identical reaction products, or, if these differ, to show what amendment of conditions are needed. The points at which quality control tests can be made and the nature of the tests may also be determined. The engineer's approach may well differ from this, with greater emphasis on production efficiency. For full value from the work a combination of the two is required. Although this is a very obvious comment, so well recognized in the chemical industry as might appear to make it superfluous, many of the processes in materials manufacture are not within the usual scope of the chemical engineer and hitherto it is only in isolated cases that methods of attack have been applied to them similar to those the chemist and chemical engineer would normally apply to products in the chemical industry. In the author's view, an extension of this sort is likely to prove of more immediate benefit than in almost any other field of materials research.

THE INTERPRETATION OF RESEARCH RESULTS

Since the war, a great deal more attention has been paid to what may perhaps best be described as the technique or techniques of transferring research findings into active practical application. While this applies to all aspects of building research, there are one or two features which apply more particularly to materials research. They have some influence on the research itself, particularly on the point to which the research needs to be carried.

The problem as a whole occurs to a large extent because of the traditional background of the building industry, which did not start on the basis of some fundamental discovery in pure science and is therefore not organized around scientific control. The applied arts have a firm interest and practice in producing its products (*i.e.*, buildings) and the application of science to it therefore needs a different approach from that adopted in many recently developed industries.

The methods and actual subjects of research which have developed on building materials have moved away from the original practical problems which led to their initiation. The tendency is towards an attempt, where possible, to reduce the findings to general principles. It is, however, important to keep in mind that there is no particular advantage in this approach unless the industry is organized in such a way that it can adapt and apply the general principles to practical problems arising in the construction of individual buildings, in which there are always many additional complicating factors. To be completely effective there would need to be a technical side to the industry itself fully complementary to the research side. In so far as this has not been completely achieved, the results of research may not be as fully effective as they might be. Pending its achievement, a partial solution may be to extend the investigation to cover a sufficient number of direct practical applications to serve as direct examples of the kind of building procedure and design needed to apply the particular principles which have been uncovered.

A more rapid outlet for a good deal of building materials research, and one in which the materials side is more favourably placed than other fields of building research, occurs when the results need not be applied directly during actual construction. For example, when an improvement in quality can be taken into the provision of a standard specification, the actual application of the research which led to this improvement becomes the concern of the manufacturer rather than the builder. There is no disturbance of building procedure other than that of ensuring the use of products made to the standard. However, the effort to apply research in terms of quality tests in a standard does affect the amount and kind of work to be done. One of the difficulties about such control tests is the need to make them sufficiently simple to permit them to be used freely without delaying production or making the cost of testing prohibitive.

It is a very far-reaching demand to make, that properties, often of a fundamental kind, should be assessable by very simple field tests. Nevertheless, in the author's view, it is one of the outstanding problems to be faced in materials research.

Other applications of materials research may not be of a type affecting a standard specification, but may still be related to manufacture of the material rather than its use. The building materials manufacture part of the building industry has necessarily a rather greater technical basis, at least in many parts of it, than the design and constructional side and the channel for application of research is to that extent easier and more rapid. It is never easy to give figures to support a review of the extent to which research results have been applied, but a general impression from the Building Research Station's experience is that when an advance has been accepted in manufacture of a particular material, application in the industry itself is accelerated and kept at an effective level because it has at its disposal the manufacturers' organizations for technical sales services and so on.

GENERAL CONCLUSIONS

In this paper it has only been possible to consider general trends, and much of very great interest has had to be omitted. Within the limits of the subject matter discussed, the following appear to the author to be the more important conclusions:—

Within the existing pattern of building material research as it has existed now for many years, room must be made for wider studies than those which relate only to durability and weather resistance. In doing so, the importance of comprehensive studies, including more long range and fundamental research, on the individual building materials is increased. Research on building materials has never been completely independent of the problems of the building industry as a whole, but at the present time there are some problems of building which, so far as the materials side is concerned, can only be attacked by a much closer integration than has existed before. Examples of these problems include the need to reduce costs of, and man-hours in, construction, and the developments in non-traditional building. It means, in effect, that there have to exist, side by side, subject research and project research, the latter being directed at problems of buildings as a whole.

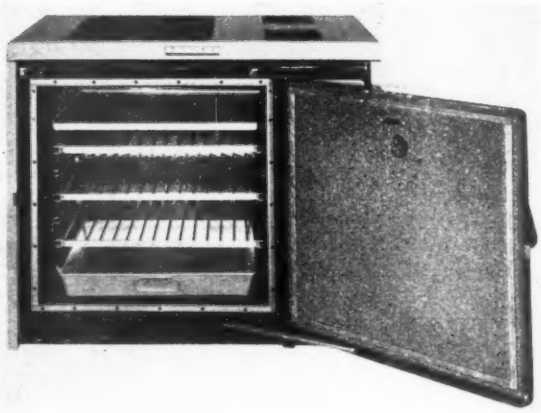
In addition, on the exclusively materials side, increased attention to research of the pilot plant type and production type is needed. Many processes have been virtually untouched so far by this kind of research.

The need for development of sufficiently reliable but very simple field tests is an urgent matter. The spread of the use of science in building requires them, while they will also be needed to help to keep costs down in modification of processes designed to reduce variability. In the last case, the cost of testing can add appreciably to the cost of the finished product.

This feature covers both the production and marketing of new materials and designs of equipment as well as the general trend of developments within the Building Industry.

THE INDUSTRY

By Brian Grant



One of the new Creda Unity ranges (the smaller model) designed for restaurants and canteens.

DATA ON SOLID FUEL

John Pinckheard's *Architectural Design Data for Solid Fuel*, published by the Coal Utilisation Joint Council, is an exceptionally thorough treatise on methods of delivery, storage and handling of solid fuel. The majority of the information cannot, of course, be new, but it is very useful to have it all in one volume. It is not possible to review the publication in full, but there are one or two minor points which perhaps deserve mention; many readers may not know of them. There is, for example, the question of the deterioration of coal whilst in storage: the loss in calorific value due to oxidation seldom exceeds 1 per cent. (less for anthracite), a much lower figure than I had imagined, and less than normal variations in combustion efficiency. General physical deterioration—increased moisture content and frost disintegration—may account for a further 1 per cent., but this will apply mainly to fuel stored in the open. Spontaneous combustion is liable to occur only in large coal stacks of 200 tons or more.

Delivery methods, too, seem to be improving a little, notably in the growing use of tipper trucks which rise with a scissors action. These are capable of discharging through a vertical trap in the wall instead of into a pavement trap. At least one firm has lorries with built-in conveyor belts which can discharge across a pavement or into a trap even higher than can be reached with the type of lorry described above. Both these developments seem likely to simplify the planning of access areas for delivery.

The book is devoted mainly to the larger types of building and covers all the fuel problems from delivery to ash removal. Get this book and keep it for reference. (*The Coal Utilisation Joint Council, 3 Upper Belgrave Street, London, S.W.*1.)

ELECTRIC COOKERS

The photograph above shows one of the Creda Unity island and wall type ranges which can be built up into cooking units of any size. The individual oven and hot plate units are made in two different types, the larger having two 16 in. by 12 in. hotplates each with a loading of 4 kw., two hotplates 6 in. by 8 in., at 1½ kw. each, and an oven of 24 in. cube, with a loading of 6·4 kw. In the smaller model, one of the 16 in. by 12 in. plates is omitted and the oven is smaller—18 in. by 18 in. by 24 in., with a loading of 4·4 kw. Dimensions are 3 ft. 5½ in. wide by 2 ft. 4½ in. deep for the larger model, while in the smaller model, the width is reduced to 2 ft. 11½ in. The height of both types is the same—2 ft. 10 in. to the top of the hotplate.

These cookers are for large-scale restaurant and canteen work and are designed so that they may be used in long rows against a wall or back to back forming an island in a large kitchen. Standard finish is in grey mottle, though other colours can be supplied at extra cost. Construction seems sturdy enough to stand up to the inevitable abuse and all electrical components are accessible from the front so that replacements can easily be carried out.

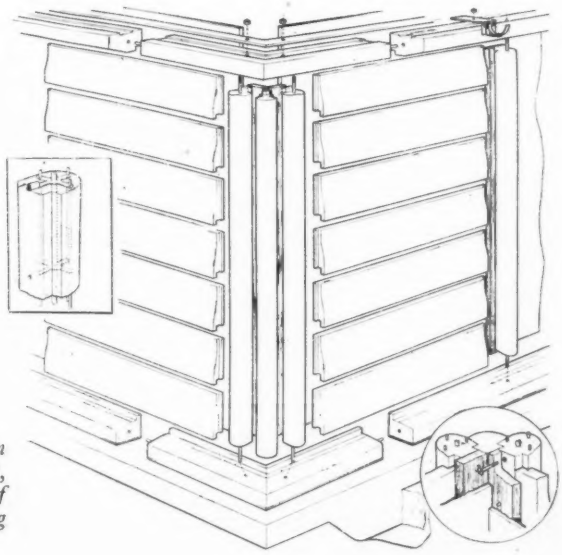
Although larger cookers are built up of separate units, the usual trouble of grease and liquids seeping down between the ovens is avoided by using a simple channel so that the hotplate becomes, in effect, continuous. Ovens have four standard shelf positions and hotplates have 3-heat switches, though Simmerstat switches are available as an alternative. (*Simplex Electric Co. Ltd., Broadwell, Oldbury, Birmingham.*)

UNIT BUILDINGS

The constructional perspective below shows the method by which the "Stafford" prefabricated building is erected. The system, which was designed by P. L. Bruning, consists of only five different components, and can be used for single storey buildings of all kinds. It should be quick to erect, even when using comparatively unskilled labour. The various component parts are recoverable if the completed building should have to be modified. (*Stafford Concrete Buildings, Ltd., Rickerscote Road, Stafford.*)

LIGHTING IN THE UNDERGROUND

Even the least observant will have noticed that a lot of Underground stations have been brightened up for the Festival, mostly with tiles and paint and fluorescent lighting. To light the rather gloomy flights of stairs and the access tunnels of stations is a far from easy problem, largely because of the low ceilings, but the photograph below shows that the result can be quite cheerful. This shows the work which Falks have done at Waterloo, where a good deal of trouble has been taken because it is, after all, the main underground entrance. Fluorescent fittings on battens have been used, and, although they are installed with the lamps exposed to view, the brightness contrast is small because all the ceilings are very light. (*Falk, Stadelmann & Co. Ltd.*, 89-93, *Farringdon Road, London, E.C.*1.)



Above, Falks lighting in Waterloo Station. Right, diagrammatic perspective of the "Stafford" building system.

Readers requiring up-to-date information on building products and services may complete and post this form to The Architects' Journal, 9, 11 and 13, Queen Anne's Gate, S.W.1.

ENQUIRY FORM

I am interested in the following advertisements appearing in this issue of "The Architects' Journal." (BLOCK LETTERS, and list in alphabetical order of manufacturers names please).

.....

.....

.....

Please ask manufacturers to send further particulars to :—

NAME .....

PROFESSION or TRADE .....

ADDRESS .....

.....

A.J. 20.9.51

Buildings Illustrated

House in North End, Hampstead Heath, London, N.W.3. (Pages 348-350.) Architect: Architects' Co-operative Partnership. General Contractors: Yeomans & Partners, Limited. Sub-Contractors: Structural steel, Sommerfeld Limited; central heating, Weatherfoil Heating Systems; boiler, Janitor Boilers Limited; door and window furniture, James Gibbons Limited; casements, Boulton & Paul Limited.

Announcements

Mr. R. W. Taylor, A.M.I.E.E., will take up an appointment on October 1 with Crompton Parkinson Ltd., as Product Sales Manager of the Nelson stud welding service. Mr. Taylor recently resigned his position as Sales Manager to Cyc-Arc Ltd. Before joining that company he was Sales Manager and Director of the Power Equipment Co. Ltd., Hendon, from 1945-48. Mr. Taylor will take over from Mr. R. V. Powditch, O.B.E., T.D., A.M.I.E.E., A.I.MECH.E., who becomes Product Sales Manager, Crompton Parkinson FHP motors, on October 1.

Mr. Grahame Martin Turner, a Director of Thomas De La Rue & Co. Ltd., left London recently for a 30,000-mile tour of New Zealand and Australia. He will study the scope for the application in Australasia of Formica, his company's laminated plastic, particularly for use in the building industry, both domestically and industrially.

On Wednesday last, Mr. George Strauss, M.P., Minister of Supply, opened a large new alarm clock factory for Smiths English Clocks Ltd. at Farm Lane, Gowkthrapple, near Wishaw, Lanarkshire. The factory was planned after a team of experts had visited and made a careful study of many of the world's outstanding flow production factories in the USA, the United Kingdom and Europe. The colour scheme of the factory and its equipment has been planned with the help of the British Colour Council in order to give the maximum light, pleasure and relief from eyestrain.

Messrs. Walter Lilly & Co. Ltd. have appointed their contracts manager, Mr. Henry J. Scholey, to the board of directors of the company.

Mr. Granville F. Siegerts, of 1, Electric Parade, Seven Kings Road, Ilford, Essex, has taken into partnership Mr. Philip Lebor, DIP. ARCH., A.R.I.B.A. The style of the firm will in future be known as Siegerts & Lebor. Trade data and catalogues will be welcomed.

We regret to announce the death at his home "Craigielea," The Avenue, Hale, Cheshire, of Mr. C. Macfarlane Cullen, Chairman and Joint Managing Director of D. Anderson & Son Ltd., Stretford, Manchester, Belfast and London. Mr. Cullen was a Director of the British Plaster Board Ltd.

The 20th Annual Conference of the Institute of Housing Inc. takes place at the Spa Grand Hall, Scarborough, Yorkshire, today and tomorrow. It will be attended by between 1,000 and 1,100 officers and members of housing committees from local authorities in all parts of Britain. The theme of the Conference is "The Economics of Housing." There is to be an opening address by Mr. G. S. Lindgren, MP, Parliamentary Secretary to the MOLGP. The remainder of the Conference will be devoted to the presentation and discussion of three papers: (1) "Productivity in the Building Industry," by Sir Thomas Bennett; (2) "The Economics of Maintenance," by H. C. Hampton," and (3) "Making Ends Meet," by Hugh R. Ralph.

THE beauty and adaptability of McKechnie extruded sections is exemplified in the architectural metal work produced for the Mann George building in Cape Town. Because of their minute closeness to size and fine finish, McKechnie extrusions help manufacturers to reduce machining time, save materials, tools and labour, and increase output.

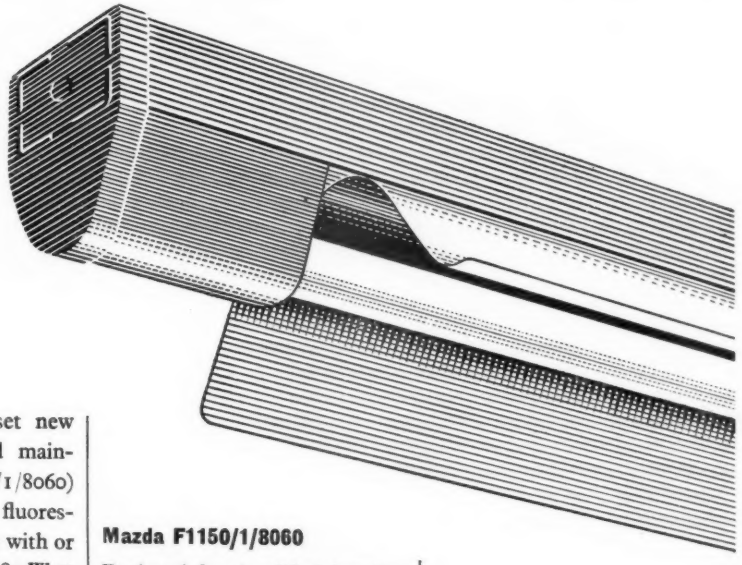
If *you* have a production or machining problem, write to McKechnie Brothers Limited, 14 Berkeley Street, London, W.1.

McKECHNIE
metal technique
McKECHNIE BROTHERS LIMITED
METAL WORKS: ROTTON PARK STREET, BIRMINGHAM, 16.
Branch Offices: London, Leeds, Manchester, Newcastle-on-Tyne.
Solder Works: Stratford, London, E.15.
Copper Sulphate and Lithopone Works: Widnes, Lancs.
Enquiries for Lithopone and Solder to: 14, Berkeley Street, London, W.1.
South African Works: McKechnie Brothers S.A. (Pty.) Ltd., P.O. Box No. 382, Germiston. S.A.

BRASS and BRONZE
EXTRUSIONS and STAMPINGS

Fluorescent lighting has never been so simple!

MUCH EASIER INSTALLATION AND MAINTENANCE



These very robust new Mazda fittings set new standards of economy in installation and maintenance. The reflector illustrated (F1150/1/8060) is for use with a single Mazda 80 Watt 5 ft. fluorescent lamp. Similar fittings are also available with or without reflector and for use with one or two 80 Watt lamps. All these fittings incorporate the new BTH Choke which is virtually silent in operation but has no compound or other filling.

Mazda F1150/1/8060

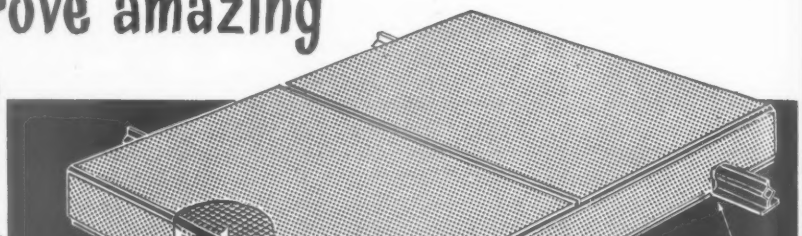
Designed for simplified installation by conduit, chain or BESA Box. Reflector slides off to expose detachable tray with auxiliary gear and lampholders ready-wired to one connector block. Lamps supported by slide-off end-covers, no spring clips required.
Embossed end-plates interlock with adjacent fittings; knock-outs are provided for through wiring.

The fitting is of bonderised sheet-steel heavily stove enamelled in light stone colour and white. All holes in the metal are rubber-bushed.
Reflector may be supplied with or without upward light slots.

M4350

For leadership in lighting
say Mazda!
THE BRITISH THOMSON-HOUSTON CO. LTD.
Crown House, Aldwych, London, W.C.2
(Member of the A.E.I. Group of Companies)

N.P.L Tests prove amazing efficiency of (New) Acoustic Tiles



Soundproofing takes a new step forward! Burgess have produced—and the National Physical Laboratory have tested (Report Ref. 1015 of 12th June 1950) an Acoustic Ceiling Tile with an exceptionally high sound absorption coefficient. (see N.P.L. chart under diagram). Construction—a specially perforated metal tray, size 24in. by 12in. by 1¼in., fitted with clips containing a non-inflammable, non-hygroscopic, sound absorbent pad. The clips make for rapid and easy attachment to the specially shaped tee bar runner. The Tiles are stove enamelled which gives this treatment an exceptionally uniform and neat appearance.

REVERBERATION ABSORPTION COEFFICIENTS TO NEAREST 0·05

Frequency c.p.s.	125	250	500	1000	2000	4000	6000	8000
"A" 3/32in. dia. hole.	0.15	0.50	0.75	0.80	0.75	0.75	0.75	0.75
"B" 1/8in. dia. hole.	0.15	0.45	0.70	0.75	0.80	0.85	0.85	0.85

HEAD OFFICE & WORKS
HINCKLEY · LEICESTERSHIRE
LONDON OFFICE
72 HORSEFERRY ROAD, WESTMINSTER, S.W.1

BURGESS
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TUBULAR ELECTRIC HEATERS

Command the largest sale in the world
Appearance — Efficiency — Economy

Obtainable from all leading stockists or direct from the Wardle factory, where "Prismalux" directional lighting units, "Workslite" reflectors and Wardle floodlights are also made.

Please write for Information Sheet 29.G1, to

THE **Wardle** ENGINEERING CO. LTD., OLD TRAFFORD, MANCHESTER, 16.

Hopwood

CLASSIFIED ADVERTISEMENTS

Advertisements should be addressed to the Advt. Manager, "The Architects' Journal," 9, 11 and 13, Queen Anne's Gate, Westminster, S.W.1, and should reach there by first post on Friday morning for inclusion in the following Thursday's paper.

Replies to Box Numbers should be addressed care of "The Architects' Journal," at the address given above.

Public and Official Announcements

25s. per inch; each additional line, 2s.

SURREY COUNTY COUNCIL.
COUNTY ARCHITECT'S DEPARTMENT.

Applications are invited for the appointment of ASSISTANT QUANTITY SURVEYOR, Grade VIII, at a commencing salary of £735 rising by annual increments of £25 to a maximum of £810 per annum, plus London allowance of £30 per annum.

Applicants should possess approved qualifications and experience, and preference will be given to those who are Members of the Royal Institution of Chartered Surveyors (Quantities Sub-Division). They should be capable of undertaking all stages of the work for the preparation of Bills of Quantities, including preliminary estimates, the preparation and settlement of final accounts, site measurement, and preparation of interim certificates.

The appointment will be subject to the provisions of the Local Government Act, 1937, and the successful applicant will be required to pass a medical examination.

Applications, stating age, qualifications and experience, and accompanied by copies of three recent testimonials, should be sent to the County Architect, Surrey County Council, County Hall, Kingston-upon-Thames, not later than the 6th October, 1951.

Canvassing, either directly or indirectly, will disqualify a candidate from consideration.

The Council will be unable to provide any housing accommodation and the successful applicant will be expected to make his own arrangements in this direction.

T. W. W. GOODERIDGE,
Clerk of the Council.

County Hall, Kingston-upon-Thames. 4316

CITY OF PLYMOUTH.
CITY ARCHITECT'S DEPARTMENT.
APPOINTMENT OF QUANTITY SURVEYOR.

Applications are invited for the appointment of a Quantity Surveyor A.P.T. Grade V (£570 to £620) on the established staff, subject to the Conditions of Service of the National Joint Council for local authorities administrative, professional, technical and clerical services, the Local Government Superannuation Act, 1937, and one month's notice on either side for termination. Applicants must be thoroughly experienced in all branches of the work of a Quantity Surveyor and should be Corporate Members of the Royal Institution of Chartered Surveyors (Sub-Division III. Quantities). The successful candidate will be required to pass a medical examination.

Applications on forms obtainable from the undersigned, accompanied by copies of not more than three recent testimonials and/or names of persons to whom reference may be made, should be received at my office not later than Saturday, 29th September, 1951.

THE CORPORATION MAY MAKE HOUSING ACCOMMODATION AVAILABLE TO THE SUCCESSFUL MARRIED CANDIDATE IF REQUIRED.

H. J. W. STIRLING, A.R.I.B.A.,
City Architect.

Seymour Road, Plymouth. 4318

NEWCASTLE-UPON-TYNE REGIONAL HOSPITAL BOARD SPECIAL AREA COMMITTEE FOR CUMBERLAND AND NORTH WESTMORLAND.
DIVISIONAL ARCHITECT'S OFFICE.
ARCHITECTURAL ASSISTANT.
Grades A.P.T. IV or V, £480 to £525 and £520 to £570 respectively.

Applications are invited for the above permanent appointment in the office of the Divisional Architect for the Special Area (who is on the staff of the Board's Architect). The offices of the Special Area Committee are situated in Carlisle, and the successful applicant will be a member of a team of three concerned solely with practical architectural work. Applicants should at least have passed the Intermediate Examination of the Royal Institute of British Architects, and be studying for the Final Examination. The appointment will be made on either Grade IV or Grade V according to qualifications and experience. Good general experience in design and construction are essential and a knowledge of hospital work is of advantage. The salary scales of professional and technical staff will shortly be regarded with a view to improvement.

The appointment will be subject to the provisions of the National Health Service (Superannuation) Regulations, 1947. The successful candidate will be required to pass a medical examination.

Applicants should state: (1) Name and full address; (2) age and whether married; (3) degrees and professional qualifications; (4) experience; (5) present appointment and salary; (6) war service; (7) date available if appointed, and (8) names and addresses of three referees.

Applications to be sent to the Clerk to the Special Area Committee, 1, Lonsdale Street, Carlisle, within 14 days of the appearance of this advertisement. 4365

MINISTRY OF WORKS.

There are vacancies in the Chief Architect's Division for ARCHITECTURAL ASSISTANTS, with recognised training and fair experience. Successful candidates will be employed in London and elsewhere on a wide variety of Public Buildings, including Atomic Energy and other Research Establishments, Telephone Exchanges, and Housing.

Salary: Architectural Assistants, £300-£525 per annum. Starting pay will be assessed according to age, qualifications and experience. These rates are for London; a small deduction is made in the Provinces.

Although these are not established posts, some of them have long term possibilities, and competitions are held periodically to fill established vacancies.

Apply in writing, stating age, nationality, full details of experience, and locality preferred, to Chief Architect, Ministry of Works, Abell House, John Islip Street, London, S.W.1, quoting reference WG10/BC. 2914

BOROUGH OF SUTTON AND CHEAM.
BOROUGH ENGINEER AND SURVEYOR'S DEPARTMENT.
APPOINTMENT OF ARCHITECTURAL ASSISTANT.

Applications are invited for the appointment of an Architectural Assistant, in the Department of the Borough Engineer and Surveyor, at a salary in accordance with Grade IV of the A.P.T. Division of the National Scale of Salaries, plus London "weighting." Housing accommodation may be made available if necessary.

The appointment, which is terminable by one month's notice in writing on either side, is on the permanent staff of the Corporation, and is subject to the provisions of the Local Government Superannuation Act, 1937. The successful candidate will be required to pass a medical examination.

Forms of application may be obtained from Mr. N. H. Michell, A.M.I.C.E., M.I.Mun.E., Borough Engineer and Surveyor, to whom they should be returned, accompanied by copies of three recent testimonials, not later than 1st October, 1951, endorsed "Architectural Assistant."

Canvassing, directly or indirectly, will be a disqualification.

A. PRIESTLEY,
Town Clerk.

Municipal Offices, Sutton, Surrey.
August, 1951. 4295

NATIONAL COAL BOARD—NORTH-WESTERN DIVISION.

Applications are invited for the following positions:—

(*a*) ARCHITECT GRADE II. Salary scale £450 × £25—£700 per annum. Applicants should be members of the Royal Institute of British Architects with experience in the preparation of sketch plans and full working drawings, negotiations with specialist sub-contractors and supervision of work under construction.

(*b*) ARCHITECTURAL ASSISTANT GRADE I. Salary scale £410 × £20—£550 per annum. Applicants should have recent experience in the preparation of sketch plans and full working drawings for actual contracts. Preference will be given to students of the R.I.B.A.

(*c*) ARCHITECTURAL ASSISTANT GRADE II. Salary scale £300 × £20—£440 per annum. Applicants should have experience in the preparation of working drawings under supervision. A good standard of draughtsmanship will be required and preference will be given to applicants working for the Intermediate R.I.B.A. Examination.

(*d*) QUANTITY SURVEYOR GRADE II. Salary scale £450 × £25—£700 per annum. Applicants should be Members of the Royal Institute of Chartered Surveyors (Quantities Section) with experience in the preparation of estimates, bills of quantities, measuring up and adjustments of final accounts.

Appointments will be made within the salary scales according to the applicants' experience and qualifications.

Applications stating age, education, qualifications, experience and present appointment should be submitted within fourteen days of publication to the Divisional Establishment Officer, National Coal Board, North-Western Division, 40, Portland Street, Manchester, 1.

Applicants should state clearly the appointment for which application is made both in the letter and on the envelope. 4368

BOROUGH OF ILFORD.
APPOINTMENT OF TEMPORARY ARCHITECTURAL ASSISTANT (GRADE IV).

Applications are invited for the position of Temporary Architectural Assistant on the staff of the Borough Engineer's Department.

Salary in accordance with Grade IV of the A.P.T. Division, *viz.*, £530 × £15—£575, plus London weighting.

Candidates should possess approved qualifications and have general Architectural experience in Municipal Buildings, particularly with regard to the preparation of contracts and of working drawings.

The appointment will be subject to one month's notice on either side, to the provisions of the Local Government Superannuation Act, 1937, the National Conditions of Service, and to medical examination.

Forms of application obtainable from the Town Clerk, Town Hall, Ilford, should be returned not later than the 24th September, 1951. 4353

COUNTY BOROUGH OF STOCKPORT.
ARCHITECTURAL ASSISTANTS (GENERAL AND HOUSING).

Applications are invited for the following positions:—

ARCHITECTURAL ASSISTANT (GENERAL). Salary A.P.T., Grade V (£570-£620).

ARCHITECTURAL ASSISTANT (HOUSING). Salary A.P.T., Grade III (£500-£545).

TWO TRAINEES. Salary grade, General Division at age 21: Male, £245; female, £196.

The appointments will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidates will be required to pass a medical examination.

Applications, stating age, qualifications, and experience, together with copies of two recent testimonials, must be delivered to me not later than 29th September, 1951.

Candidates must disclose whether to their knowledge they are related to any member or senior official of the Council.

WM. F. GARDNER, M.I.C.E., A.M.T.P.I.,
Borough Surveyor.

Town Hall, Stockport. 4325

CHESTER-LE-STREET RURAL DISTRICT COUNCIL.
SENIOR ARCHITECTURAL ASSISTANT.

Applications are invited for the permanent appointment of a Senior Architectural Assistant, on the staff of the Council's Housing Architect and Planning Officer.

Applicants should have had some previous experience in the preparation of layout plans and house type plans for housing schemes, and membership of the Royal Institute of British Architects will be an advantage.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the National Joint Council scheme of Conditions of Service for Local Government Officers.

Salary will be in accordance with qualifications and experience as determined by the National Joint Council for Local Authorities Administrative Services, *i.e.*, up to and including Grade V (£570—£620) per annum.

The Council cannot undertake to provide housing accommodation for the successful candidate.

Applications must be made on the prescribed form of application which can be obtained on request and must be delivered to the undermentioned, not later than 12 noon, Saturday, 6th October, 1951.

R. C. BELL,
Clerk of the Council.

Union Offices, Chester-le-Street, Co. Durham.
12th September, 1951. 4366

CITY AND COUNTY OF NEWCASTLE-UPON-TYNE.
CITY ARCHITECT'S DEPARTMENT.

Applications are invited for the following appointments in the Quantity Surveyor's Section:—

(*a*) ONE SENIOR ASSISTANT QUANTITY SURVEYOR, A.P.T. Division Grade VI (£645—£710).

(*b*) ONE ASSISTANT QUANTITY SURVEYOR, A.P.T. Division Grade V (£570—£620).

Applicants must have had experience in the preparation of bills of quantities, specifications, estimates, and the settlement of final accounts on all kinds of building contracts. Preference will be given to professional Associates of the Royal Institution of Chartered Surveyors.

The appointments will be subject to the National Conditions of Service as adopted by the City Council, to the provisions of the Local Government Superannuation Act, 1937, and to one month's notice on either side. Successful candidates will be required to pass a medical examination.

Applications stating position applied for, particulars of training, qualifications, experience, present and past appointments, together with copies of two recent testimonials or the names and addresses of two persons to whom reference may be made, should be addressed to George Kenyon, A.R.I.B.A., A.M.T.P.I., City Architect, 18, Cloth Market, Newcastle-upon-Tyne, 1, not later than the 29th September, 1951.

JOHN ATKINSON,
Town Clerk.

Town Hall, Newcastle-upon-Tyne, 1.
11th September, 1951. 4367

BISHOP AUCKLAND URBAN DISTRICT COUNCIL.
TEMPORARY ARCHITECTURAL ASSISTANT.

Applications are invited for the appointment of a Temporary Architectural Assistant to work under the direction of the Council's Architect, Surveyor and Engineer. The salary for the appointment will be in accordance with Grade IV of the A.P.T. Division of the National Scales, *viz.*:—£530 × £15—£575 per annum. Applicants must be Corporate Members of the Royal Institute of British Architects. The appointment will be subject to the Local Government Superannuation Act, 1937, and also to one month's notice on either side.

Applications stating age, qualifications, past and present appointments, experience, and giving the names of two persons to whom reference can be made must reach the undersigned not later than Saturday, 6th October, 1951.

R. W. BLYTHE,
Clerk of the Council.

Town Hall, Bishop Auckland.
10th September, 1951. 4361

COUNTY BOROUGH OF GREAT YARMOUTH.
APPOINTMENT OF GENERAL ASSISTANT ARCHITECT.

Applications are invited for the appointment of a General Assistant Architect, in the Borough Engineer's Department, for housing, seaside and general work, at a salary in accordance with A.P.T., Grade IV (£530-£575).

Applicants should have passed the Intermediate Examination of the R.I.B.A. The appointment will be terminable by one month's notice on either side, subject to the provisions of the Local Government Superannuation Act, 1937, and to the passing of a medical examination. The Council are unable to offer housing accommodation to the successful candidate.

Applications, stating age, qualifications and experience, together with the names of three persons to whom reference may be made, should be enclosed in an envelope endorsed "General Assistant Architect," and must be received by me not later than Friday, the 28th September, 1951.

Candidates must disclose in writing whether they are related to any member or officer of the Council. Canvassing, directly or indirectly, will disqualify.

FARRA CONWAY,
Town Clerk.

Town Hall, Great Yarmouth.
4th September, 1951. 4350

GOVERNMENT OF NORTHERN IRELAND.
CIVIL SERVICE COMMISSION.
ASSISTANT QUANTITY SURVEYOR.

Applications are invited for the permanent and pensionable post of Assistant Quantity Surveyor, Class I, in the Ministry of Health and Local Government, Northern Ireland.

Qualifications: Candidates must be Associates of the Royal Institution of Chartered Surveyors (formerly P.A.S.I. Quantities Section). A wide experience of quantity surveying in all its branches is essential. Preference will be given to those with a working knowledge of current housing practice and an aptitude for cost analysis.

Remuneration: The salary scale is £500 rising by annual increments of £25 to £750 (linked to entry at age 26 plus £25 for each year above that age subject to a limit of £650 and minus £25 for each year below that age). This scale will be revised in the near future.

Preference will be given to suitably qualified ex-Servicemen who served in the 1914-18 or 1939-45 wars provided they can, or within a reasonable time will be able to, perform the duties efficiently.

Closing date: Applications must be made on the prescribed form which may be obtained from the Secretary, Civil Service Commission, Stormont, Belfast, and must be returned duly completed with copies of two recent testimonials so as to reach him not later than 8th October, 1951. 4363

CIVIL SERVICE COMMISSION, DUBLIN.
POSITION VACANT.

ARCHITECTURAL INSPECTOR in the Department of Health. Salary scales (approx.): Man, £890—£1,071; woman: £708—£890. Age limits: 27-45 years with extensions of the upper limit in certain cases. Essential qualifications include satisfactory practical experience in the design and construction of buildings, the preparation of designs and contract drawings from sketches or instructions and the supervision of building contracts.

Further particulars obtainable from the Secretary, Civil Service Commission, 45, Upper O'Connell Street, Dublin. Latest time for accepting completed application forms: 5 p.m. on the 16th October, 1951. 4364

SALOP COUNTY COUNCIL.
COUNTY ARCHITECT'S DEPARTMENT.

Applications are invited for the appointment of SENIOR ASSISTANT ENGINEER, on A.P.T., Grade VI (£645, rising to £710 per annum). Applicants must be experienced in the preparation of drawings and specifications for central heating and hot-water supply installations, and preference will be given to Associate Members of the Institution of Heating and Ventilating Engineers.

The appointment will be subject for its termination to one month's notice in writing on either side; to the terms of the National Joint Council's Scheme of Conditions of Service and to the provisions of the Local Government Superannuation Act, 1937. The successful applicant will be required to pass a medical examination.

Application forms may be obtained from the County Architect, Mr. C. H. Simmons, A.R.I.B.A., Dip.T.P., Column House, London Road, Shrewsbury, to whom they must be returned, accompanied by copies of three recent testimonials, not later than Friday, 5th October, 1951.

G. C. GODBER,
Clerk of the Council.

Shrewsbury.
September, 1951. 4356

BUCKS COUNTY COUNCIL.

The County Architect invites applications from qualified ASSISTANT ARCHITECTS who possess a keen and energetic enthusiasm for their profession. Candidates should preferably have been trained at a recognised School of Architecture. Salary Grade VI, £645-£710 per annum.

The appointment is superannuable, and subject to medical examination.

A weekly allowance of 25s. and return fare home once every two months may be paid for six months to newly appointed married officers of the Council unable to find accommodation.

Further particulars and form of application may be obtained from the County Architect, County Offices, Aylesbury, to whom applications must be delivered by 1st October, 1951. 4336

LINDSEY COUNTY COUNCIL.
COUNTY ARCHITECT'S DEPARTMENT.

Vacancies on the permanent staff as follows:—
(*a*) ARCHITECTURAL ASSISTANT. A.P.T., IV (£530-£575).
(*b*) ARCHITECTURAL ASSISTANT. A.P.T., III (£500-£545).

Applicants should have passed the Intermediate Examination of the R.I.B.A. or its equivalent, and have had practical experience.

N.J.C. Conditions of Service. Canvassing will disqualify.

Allowance of 25s. per week and return fare home bi-monthly may be paid up to six months to married men unable to find housing accommodation.

Relationship to a member or senior officer of the Council is to be disclosed in writing by any applicant with his application.

Applications, stating age, qualifications and experience, with the names of two persons to whom reference can be made, to be sent to the undersigned not later than Thursday, 27th September, 1951.

A. RONALD CLARK, A.R.I.B.A., A.M.T.P.I.,
County Architect.

County Offices, Lincoln. 4352

BOROUGH OF CHELTENHAM.
APPOINTMENT OF SENIOR ARCHITECTURAL ASSISTANT.

Applications are invited for the appointment of a Senior Architectural Assistant in the Department of the Borough Surveyor, at a salary and subject to the conditions contained in the National Scheme of Salaries and Conditions of Service—namely, A.P.T., Grade VII, £685-£760 per annum.

Applicants should be qualified, and experienced in the design of Public Buildings, Housing and Ancillary Buildings in connection with Estate Development.

The appointment is subject to one month's notice on either side, and the successful applicant will be required to pass a medical examination and contribute to the Council's Superannuation Fund.

Applications, endorsed "Senior Architectural Assistant," stating age, qualifications, experience, and giving the names of two referees, to reach Mr. G. Gould Marsland, M.B.E., B.Sc., M.Inst.C.E., Borough Surveyor, Municipal Offices, Cheltenham, not later than Saturday, 29th September, 1951. 4351

CROWN AGENTS FOR THE COLONIES.

ARCHITECTURAL ASSISTANT required by the Government of Northern Rhodesia for the Public Works Department, for one tour of 36 months. Commencing salary according to age and experience, in the scale £510 rising to £865 a year, plus cost of living allowance, at present equal to 16 per cent. of salary. Gratuity of £25 for each three months' service on satisfactory completion of contract. Free passages. Liberal leave on full salary. Candidates 23 years or over should be students of the Royal Institute of British Architects or have had four years' practical experience. (Candidates will be accepted at the minimum of the scale from age 21 years if they have passed the Intermediate examination of the Institute.) A knowledge of survey work and modern school practice would be an advantage.

Apply at once by letter, stating age, full names in block letters and full particulars of qualifications and experience, and mentioning this paper to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting M.27758/A, on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. 4362

LONDON ELECTRICITY BOARD.
ASSISTANT QUANTITY SURVEYORS.

Applications are invited for the above positions in the Construction Branch of the Chief Engineer's Department at Lesco House, Stamford Street, S.E.1.

Applicants should be experienced in the preparation of Bills of Quantities in all their stages, measurement of Variations and remeasurement of Contracts, and will work under the direction of a Chartered Quantity Surveyor.

The posts have been graded under the National Joint Board agreement of February 17, 1950, as Grade V (Schedule C). Salary range: £607 19s. to £814 16s. per annum inclusive, the commencing salary being dependent upon qualifications and experience. This grading is subject to the approval of the District Joint Board and confirmation by the National Joint Board.

Application forms obtainable from Establishments Officer, 46, New Broad Street, E.C.2, to be returned duly completed within 10 days from the appearance of this advertisement. Please enclose addressed foolscap envelope and quote Ref. EST/V/1216/A on envelope and all correspondence. 4349

LONDON COUNTY COUNCIL.
ARCHITECT'S DEPARTMENT.

Applications are invited for positions of ARCHITECT Grade III (£550-£700) and TECHNICAL ASSISTANT (up to £580) for architectural work on new housing, schools and other public buildings. The positions are superannuable, and the above rates are subject to an addition of 10 per cent. on the first £600 and 7½ per cent. on any remainders. Application forms from the Architect, The County Hall, S.E.1, enclosing stamped addressed foolscap envelope and quoting AR/EK/A. Canvassing disqualifies. (514) 3914

LANCASHIRE COUNTY COUNCIL.

Applications are invited for the following appointments in the County Planning Department:—

(1) SENIOR PLANNING ASSISTANTS (ARCHITECTURAL), A.P.T., VI (£645-£710) required at Headquarters, Preston. Duties include design and preparation of detailed layouts for housing schemes, village extensions, and central area improvements. Candidates must be qualified Architects.

(2) PLANNING ASSISTANT, A.P.T., I-V (£440-£620), required at the Liverpool Divisional Office. Salary commensurate with qualifications and experience. Candidates for Grade V should be qualified by professional examination as Architects, Surveyors, Engineers or Town Planners, and for Grades I-IV should possess a University Degree or the Intermediate Certificate of an appropriate professional body.

Applications, stating clearly appointment applied for, and giving the names, addresses and qualifications of two referees (preferably one should be present employer), should reach the County Planning Officer, East Cliff County Offices, Preston, by Monday, 15th October. 4357

CARDIGANSHIRE COUNTY PLANNING COMMITTEE.
APPOINTMENT OF PLANNING ASSISTANT (GRADE VI).

Applications are invited for the post of Planning Assistant in the County Planning Department, at a salary in accordance with A.P.T., Grade VI (£645-£710).

Applicants should be Members or Associate Members of the T.P.I., preferably with complementary qualifications, and should be experienced in the preparation of Development Plans and Planning Surveys, and experience in the supervision of staff is essential.

The post is established, pensionable, subject to medical assessment and prescribed conditions. The Council cannot undertake to provide housing accommodation for the person appointed.

Applicants should give particulars of age, education, technical training, qualifications, experience, present salary, present and previous appointments which, together with the names of two referees, must reach the undersigned not later than noon on Saturday, 6th October, 1951.

J. E. R. CARSON,
Clerk of the County Council.

Cambrian Chambers, Aberystwyth. 4370

SHEFFIELD REGIONAL HOSPITAL BOARD.

Applications are invited for the following permanent appointment in the Architectural Division of the Headquarters' Staff of the Board:—

TWO SENIOR ASSISTANT ARCHITECTS, Grade A.P.T., VIII (£686×£25—£760 per annum). (The salary scales are at present under review.)

Applicants must be Members of the Royal Institute of British Architects, and have had experience in the design and construction of Hospitals and be capable of carrying out and advising on large building contracts.

Appointments will be subject to the National Health (Superannuation) Regulations, 1947, and will be terminable by one month's notice. Applications stating age, qualifications, present position and past experience, together with the names of three referees, should be addressed to the Secretary, Sheffield Regional Hospital Board, Fulwood House Old Fulwood Road, Sheffield, 10, not later than the 6th October, 1951. 4371

COUNTY BOROUGH OF HUDDERSFIELD.
EDUCATION COMMITTEE.

Applications are invited for appointment as ASSISTANT ARCHITECT (A.P.T., Grade VI, £645-£710).

This post offers an opportunity for gaining experience in the design and erection of School buildings in modern construction. Candidates must be Registered Architects, and preference will be given to applicants who are Members of the R.I.B.A.

The appointment will be subject to one month's written notice on either side, expiring on the last day of any month; to the successful applicant passing a medical examination; to the provisions of the Local Government Superannuation Act, 1937, and to the conditions of service of the National Joint Council.

Applications, stating age, qualifications, present appointment, experience, etc., with copies of two recent testimonials, should be submitted to the undersigned as early as possible, but not later than 10 a.m. Thursday, 27th September, 1951.

H. KAY,
Chief Education Officer.

Education Offices, Ramsden Street,
Huddersfield. 4379

BOROUGH OF BEXLEY.
BOROUGH ENGINEER AND SURVEYOR'S DEPARTMENT.

Applications are invited for the following posts:—

ASSISTANT ARCHITECT (General). Salary within Grade A.P.T., VI (£645-£710 per annum), plus London "weighting" allowance (£30).

ASSISTANT ARCHITECT (General). Salary within Grade A.P.T., V (£570-£620 per annum), plus London "weighting" allowance (£30).

Forms of application with Conditions of Appointment may be obtained from the Borough Engineer and Surveyor, West Lodge, Bexleyheath, to whom completed applications must be returned by Friday, 5th October, 1951.

Canvassing, directly or indirectly, will disqualify.

W. WOODWARD,
Town Clerk.

4378

ARCHITECTS, MAINTENANCE SURVEYORS, QUANTITY SURVEYORS, AND LANDS OFFICERS.

THE CIVIL SERVICE COMMISSIONERS invite applications for permanent appointments to the basic (Assistant) grades given above in a number of Departments in England and Scotland. Applications will be accepted at any time up to and including 31st December, 1951. Selected candidates will be interviewed as soon as possible after the receipt of their application forms. Successful candidates may expect early appointments. Candidates are advised to apply as early as possible.

All candidates must be at least 25 and under 35 years of age on 1st January, 1951, with extension for regular service in H.M. Forces, and up to two years for permanent Civil Servants. All candidates must have the appropriate professional qualifications and experience.

The London salary scale for men aged 30 and over is £600×£25—£750. Lower starting salary for younger entrants (from £475 at age 25).

(The next higher grades are: Main Grade, £750×£25—£1,000; Senior Grade, £1,050×£35—£1,270.)

Salaries for women and for officers appointed to the provinces will be somewhat lower.

Forms of application and copies of the regulations with full details of qualifications required from the Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London, W.1, quoting No. 3405TA. Completed application forms should be returned as soon as possible. 4380

CAMBRIDGESHIRE COUNTY COUNCIL.
COUNTY PLANNING DEPT.

Applications are invited for the appointment of a PLANNING OFFICER on Grade A.P.T., VIII, of the National Joint Council's Scales (salary £735 to £810 per annum).

Candidates should hold the qualifications A.R.I.B.A. and A.M.T.P.I., and be able to drive a car. A wide knowledge of modern planning technique will be required, and previous experience in a planning office will be an advantage.

The successful candidate will be in charge of the design aspect of the County Development Plan, including the preparation of schemes for village development and central area redevelopment. He will also be expected to advise on housing layouts and general landscape design.

The appointment is subject to the provisions of the Local Government Superannuation Act, 1937, the Council's Conditions of Service, to the successful candidate satisfactorily passing a medical examination, and to three months' notice on either side of termination of appointment. Financial assistance, up to £2 weekly for a period not exceeding six months, may be given if the person appointed cannot obtain housing accommodation and has to maintain his own present residence in addition to the expense of lodgings in Cambridge.

Applications, stating age, past and present appointments (with dates), experience, qualifications, present salary and the names of two referees, should be received by the undersigned not later than the 15th October, 1951.

CHARLES PHYTHIAN,
Clerk of the County Council.
Shire Hall, Castle Hill, Cambridge. 4358

CORBY DEVELOPMENT CORPORATION.

Applications are invited from well qualified persons for the appointment of CHIEF ARCHITECT, at a commencing salary within the range of £1,500-£1,700, according to experience and qualifications.

Candidates must have had considerable experience in the design and execution of large scale housing operations and other buildings for local authorities, and the necessary staff organisation and control. Town Planning experience, though not essential, may be an advantage.

The appointment is under the direction of the General Manager, and is expected to involve large scale construction projects associated with the development of a New Town.

The successful candidate will be required to pass a medical examination, to contribute either to a Superannuation or an Assurance Scheme, and to carry out such duties as the Corporation may require.

Applications, stating age, education, training, qualifications, experience, past and present appointments and salaries, together with the names of two persons to whom reference may be made, must be received by the undersigned not later than Monday, 15th October, 1951. Envelopes and applications should be clearly endorsed "Chief Architect."

R. F. BROOKS GRUNDY,
General Manager.
Corby Development Corporation,
The Stone House, Corby, Northants. 4369

COUNTY BOROUGH OF BURNLEY.
PLANNING ASSISTANT.

Applications are invited for the above appointment in the Borough Surveyor's Department at a salary within the range of A.P.T. Grade III (£500—£545 per annum) to Grade V (£570—£620 per annum) according to experience and qualifications.

Applicants should have had experience in a similar capacity and preference will be given to candidates holding a recognised qualification.

Forms of application, etc., may be obtained from the Engineer and Surveyor, 22-24, Nicholas Street, Burnley, to whom applications should be returned not later than Monday, 8th October, 1951.

C. V. THORNLEY,
Town Clerk.
4390

COUNTY BOROUGH OF HALIFAX.
BOROUGH ENGINEER'S DEPARTMENT.

Applications are invited for the following appointments:—

(*a*) ARCHITECTURAL ASSISTANT (Education) Grade VI. £645—£710.

(*b*) BUILDING MANAGER. £12 per week.

(*c*) QUANTITY SURVEYOR'S CLERK, Misc. Grade IV. £400—£470.

The successful candidate for post (*a*) will be engaged on the building and planning of new Schools, should have had previous experience in this branch of architecture and should possess appropriate technical qualifications.

The successful candidate for post (*b*) will have direct control of the Building Section of the direct labour organisation of the Borough Engineer's Department and it is essential that he should have had extensive experience in the supervision and organisation of building works.

Candidates for post (*c*) should have had experience in the handling of builders' quantities and should be competent to act as an assistant to the Quantity Surveyor.

The appointments will be subject to the conditions of service adopted by the Corporation and to the Local Government Superannuation Act, 1937.

Candidates must disclose whether to their knowledge they are related to any member of or holder of any senior office under the Council.

Applications stating age, qualifications, present position, salary and experience accompanied by copies of three recent testimonials should be appropriately endorsed and delivered to the undersigned not later than Wednesday, 3rd October, 1951.

RICHARD DE Z. HALL,
Town Clerk.
Town Hall, Halifax.
13th September, 1951. 4384

ROAD HAULAGE EXECUTIVE.

Vacancies in London for ARCHITECTURAL DRAUGHTSMEN. Applicants should have passed the Intermediate Examination of the R.I.B.A., be capable of preparing working drawings and details and be neat and accurate draughtsmen with a minimum of five years' experience in drawing offices. Some school training will be an advantage. Salary within the range £520—£550. Applications in duplicate, giving date of birth, qualifications, experience, present post and salary, should reach the Chief Staff and Welfare Officer (S.219), Road Haulage Executive, 222, Marylebone Road, London, N.W.1, within seven days of the appearance of this notice. Selected candidates will be required, if eligible, to join a contributory superannuation scheme. 4386

METROPOLITAN BOROUGH OF PADDINGTON.
APPOINTMENT OF ASSISTANT DIRECTOR OF HOUSING (TECHNICAL) (A.P.T. X)
(£900—£1,030).

Applications are invited for this appointment within the above grade.

Candidates must (i) be chartered and registered architects with considerable practical and administrative experience in all branches of building work; (ii) have had good experience in contemporary design; and (iii) be thoroughly conversant with local authority work. Some town planning experience would be an advantage.

The successful candidate will be directly responsible to the Director of Housing for the technical work of the Housing Department. This work includes the design and supervision of large housing schemes, building work for Council departments, liaison with consultants engaged in connection with Council housing schemes and the direct supervision of the technical staff.

Candidates must furnish information under the following headings, *viz* :—

(i) Age; (ii) qualifications; (iii) present and previous appointments and dates; (iv) experience, and (v) names and addresses of three referees.

Covering envelopes must be endorsed "Appointment A.29" and should reach me by 10 a.m. on 8th October, 1951.

W. H. BENTLEY,
Town Clerk.

Town Hall, Paddington, W.2.
14th September, 1951. 4385

Architectural Appointments Vacant

4 lines or under, 7s. 6d.; each additional line, 2s.

ARCHITECTURAL ASSISTANT required in Westminster office of Consulting Engineers. Apply, stating age, experience, qualifications, and commencing salary required. Box 4292.

IMPERIAL CHEMICAL INDUSTRIES, LTD., NOBEL DIVISION, requires ARCHITECTURAL ASSISTANTS, to work at Stevenston, Ayrshire. Associateship of the Royal Institute of British Architects would be an advantage, but not an essential qualification. Applicants should have some experience in factory buildings, offices, canteens, etc. Applications should be made to the Staff Manager, Nobel House, 25, Bothwell Street, Glasgow, C.2. 4321

ARCHITECTURAL ASSISTANTS required immediately in Warrington office for preparation of detailed working drawings. Write, stating experience, qualifications and salary required. to Box 4320.

BOOTS PURE DRUG CO. LTD., NOTTINGHAM.
ARCHITECT'S DEPARTMENT.

Applications are invited for the appointment of ARCHITECTURAL ASSISTANTS to the permanent staff of the above department. Applicants should have had several years experience in an architect's office and be capable of carrying out a job from sketch plan to building stage. Thorough knowledge of building construction and ability to prepare neat, accurate drawings is essential. Ability to calculate to steel and reinforced concrete structures and to prepare attractive sketch plans desirable.

The department has in hand works of a very varied nature including new chemical works, laboratories, experimental farms, office buildings, housing, schools, generating plants and retail shop premises, etc. Permanent and progressive appointment for the right men who will be required occasionally to visit works in progress of building in all parts of the British Isles.

A five-day week is in operation and the successful applicant will be required to pass a medical examination and to join the company's pension scheme.

Write stating age, qualifications, training, experience and salary required to: Chief Architect, Boots Pure Drug Co. Ltd., Station Street, Nottingham. 4387

SENIOR ASSISTANT urgently required for permanent post in large General Practice in Jersey. Applicants should be 28 or over, preferably qualified, and may be interviewed by appointment in London. Assistance can be given in finding housing accommodation in Jersey. Reply, giving details of experience and salary required, Box 4334.

ARCHITECTURAL ASSISTANT, Intermediate standard, required in Architects' office of multiple shop company, interesting work, possibility of permanency. Write Box 4383.

JUNIOR ASSISTANT, about 22 years old, required in London Architect's Department. Must be neat, quick draughtsman, with knowledge of elementary construction and some experience of building surveys. Interesting work, and secure future for suitable applicant. Write, stating age, details of past work, education, and salary required. Box 4382.

JUNIOR ASSISTANT required for Architect's office in London (W.1 area). Interesting work. Progressive appointment offered to keen individual. Salary £350-£450 p.a. Write, stating age, training and experience, to Box 4381.

WANTED immediately in office of Architect dealing with domestic work for London Housing Company, ARCHITECTURAL ASSISTANT, of Inter. R.I.B.A. standard, able to prepare designs and working drawings from sketches. Salary £400 to £600 per annum, according to experience and capabilites. Pension Scheme. Box 4374.

TWO ARCHITECTURAL ASSISTANTS required. Salary £400 and £600 p.a. Apply Frederick Gibberd, 8, Percy Street, W.1. 4373

ARCHITECT'S ASSISTANT required by firm of Architects in South-West England; age 30 to 35. State experience and salary required to Box 4372.

ARCHITECTURAL ASSISTANT, with 3 or 4 years of practical office experience, required at once by Architects in South Kensington area. Salary: £350-£500 p.a., according to ability. 5-day week. Apply Box 4359.

ASSISTANT ARCHITECT required in Railway Office in London. Preferably A.R.I.B.A. Must have had several years' practical experience. Responsible for sketches and working drawings, under supervision. Commencing salary approximately £550 per annum. Apply to Civil Engineer, the Railway Executive, Southern Region, Waterloo Station, London, S.E.1. 4347

SENIOR ARCHITECTURAL ASSISTANT required for progressive London office. Considerable experience in construction, supervision, preparation of specifications, etc., essential. Interesting work. Preparedness to do 6-8 month periods abroad an advantage, but not essential. Salary according to experience. Write, giving full details, to James Cubitt & Partners, 25, Gloucester Place, W.1. 4356

ARCHITECTURAL ASSISTANT of Intermediate standard required for West End architect's office. Previous office experience preferable but not essential. Must be capable of preparing working drawings and details from sketch plans, etc. Apply stating age, experience and salary required, etc., to Box 4389.

ARCHITECT'S ASSISTANT required for ecclesiastical and general practice. Apply stating age, experience, and salary required to W. H. Randoll Blacking & Robert Potter, F/F.R.I.B.A., 21, The Close, Salisbury. 4388

Architectural Appointments Wanted

YOUNG Lady, Intermediate R.I.B.A. standard, requires post, preferably West of England. 4 years' office experience. Box 238.

ASSOCIATE (31), with ability to accept full responsibility through all stages, seeks progressive appointment, where there is scope for initiative, with prospects, in country practice. Write Box 249.

STUDENT, 5th year U.S. University, seeks experience in British office. Salary required approx. £400. Box 251.

STUDENT (Polish nationality), recently completed the 5-year course at Architectural School (exempt from Intermediate examination), seeks position in London. Private office. Box 250

ASSOCIATE R.I.B.A. (39) seeks appointment, London or S.W. Many years' varied experience, including L.A. Housing. Surveys. Driving licence. Moderate salary. Box 244.

JUNIOR ASSISTANT (Female), partly trained, with several years' office experience, seeks position with Architect. Box 243.

INDUSTRIOUS ARCH. DRAUGHTSMAN (23) requires position, with prospects, in London or district office. Experienced in working drawings, details, surveys, etc. 245

REGISTERED ARCHITECT of exceptional ability and experience, with reputable employers both home and overseas, seeks position of responsibility with firm producing industrial schemes, public buildings and works, etc. Taking special Final Examination in November. Box 247.

YOUNG Man (22), Leicester School Arch. Diploma, requires position in a private office of a southern or coastal town. Box 248.

PROBATIONER R.I.B.A. (24) urgently requires job. Holds National Certificate in Building. London or West Essex. R. K. Miller, 32, St. George's Avenue, Forest Gate, E.7. 246

STUDENT (22), recently completed the 5-year course at a recognised school, seeks position in London office. Box 241.

QUALIFIED ARCHITECT seeks part-time work, 3 to 4 days per week, London area. Box 4391.

MALE ARCHITECTURAL ASSISTANT (24), Inter. and Final standard, 5 years' full-time training, seeks post, 15 miles Bath or Bristol area. Box 237.

Other Appointments Vacant

4 lines or under, 7s. 6d.; each additional line, 2s.

THE RAILWAY EXECUTIVE (Western Region) have a vacancy in the Estate and Rating Surveyor's Department, Paddington, for a TECHNICAL ASSISTANT. Applicants should be good Architectural Draughtsmen with a sound knowledge of building construction, capable of preparing drawings and specifications and exercising supervision of building work. Salary according to age (£310 at 23), rising to maximum of £515 at 36, with prospects of advancement. Apply in writing to The Estate and Rating Surveyor, 125, Westbourne Terrace, London, W.2. 4346

Services Offered

4 lines or under, 7s. 6d.; each additional line, 2s.

ARCHITECTURAL ASSISTANTS require additional work. Surveying, Levelling, Working Drawings, Details, Tracings, etc. W. Graysmark, 41, Wadham Gardens, Greenford, Middx. 4333

DURING present restrictions on private building, small post-war Partnership with extensive architectural and civil engineering experience is available to give temporary assistance to other professional firms. Box 4375.

LADY ARCHITECT (33), with University degree-diploma and two years' public office experience, going abroad early next year, offers her services for 4-5 months to an Architect or Contractor. Willing to work hard, but only where is sure to find excellent all-round practical experience. Present salary £560; may accept less. Central or West London preferably. Box 4377.

OFFICE requires additional work to keep staff. Operating London, Bedfordshire and Eastern Counties. Work kept strictly confidential. Box 4376.

CAPABLE and efficient ARCHITECTURAL DRAUGHTSMAN seeks spare-time work. 30-mile radius of London. Box 4360.

Miscellaneous

4 lines or under, 7s. 6d.; each additional line, 2s.

A. J. BINNS, LTD., Specialists in the supply and fixing of all types of Fencing, Gates and Cloakroom Equipment. Harvest Works, 99-107, St. Paul's Road, N.1. Canonbury 2061.

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FENCING FOR ALL PURPOSES. Supplied and erected; established 100 years. Parker, Winder & Achurch, Ltd., 80, Broad Street, Birmingham, 1. Telephone: Midland 5001.

DEMOLITION Site Clearance, by Syd Bishop & Sons, Demolition Contractors, Swanley, Kent. 'Phone Swanley 2519. 4216

"MAY I ASSIST YOU?" Quantity Surveyor available to prepare Bills of Quantities, quickly. Large War Damage Claims negotiated. Please write and interview will be arranged at once. Box 4315b.

INSURANCE

ARCHITECTS' Indemnity Insurance effected. Please write for Proposal Form to E. J. SAXBY, Incorporated Insurance Broker, 37a, Carfax, Horsham, Sussex. Tel. 990. 2039

Educational Announcements

4 lines or under, 7s. 6d.; each additional line, 2s.

R.I.B.A. and T.P.I. EXAMS.—Stuart Stanley, M.A., F.R.I.B.A., M.T.P.I., T.P.Distn. (Tutor Sch. of Arch. Lon. Univ.), and G. A. Crockett, B.A., A.R.I.B.A. (Medallist), A.M.T.P.I., F.R.S.A., prepare students by correspondence tuition. Stuart Stanley & Crockett, 10, Adelaide Street. Strand. W.C.2. TEM. 1603/4.

WINSTON WALKER is now enrolling Students for his Course of Lectures in Design for the Final of the R.I.B.A. Personal tuition only, and enrolment after interview only. Tel.: SLO. 1410. 4354

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